Th. Sect.

"The Sedimentation Velocity of the Erythrocytes in the Psychoses: A Study of 72 Cases".

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by

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THE SEDIMENTATION VELOCITY OF THE ERYTHROCYTES IN THE PSYCHOSES:

A STUDY OF 72 CASES.

I. TITLE.

II. INTRODUCTION.

III. TECHNIQUE.

IV. LITERATURE, (discussion of)

V. THEORIES AS TO CAUSATION OF PHENOMENON.

VI. PERSONAL RESULTS.

VII. DISCUSSION and CONCLUSION.

VIII. APPENDIX.

IX. REFERENCES.

INTRODUCTION.

By the term Sedimentation Velocity of the Erythrocytes, is meant, the rate at which these bodies fall or sediment in their plasma, leaving a clear plasma layer above, the blood having previously been treated with oxalate, citrate or other anticoagulant. This occurs more rapidly in pregnancy and certain morbid processes than in health.

The whole subject is no new one and a complete historical survey takes us back to very early times - to the days of Hippocrates and the humoral pathologists, in fact, when the "crusta phlogistica" or "buffy coat" was practically the only blood symptom known and men sought for an explanation of this phenomenon, an explanation later shown to be erroneous. Until the old humoral theories were discarded, that is, until the rise of the doctrines of the cellular pathology, the problem loomed large, but after this period lapsed, to be revived again about ten years ago by R. FAHRAEUS of Stockholm who published a series of researches into what/

what he termed the "Suspension Stability of the Blood." By this term is meant the power of the plasma to hold the erythrocytes in suspension; when the stability is lowered, the corpuscles sink with increased rapidity. This author demonstrated a lowered "Suspension Stability" and hence an increased Sedimentation Velocity (called hereafter for the sake of brevity "S.V.") in pregnancy and in certain morbid conditions, which will be alluded to in greater detail below. Since the publication of this work the phenomenon in question has been made the basis of a test - the Sedimentation Test - which has found considerable clinical application in certain departments of Medicine, notably gynaecology and tuberculosis.

FAHRAEUS included amongst his results those obtained in 18 cases of mental disorder, since when a few papers concerning the sedimentation of erythrocytes in the Psychoses have been published. These are discussed below. Feeling that the position of this test, apparently of value in certain other departments of Medicine, was by no means established in psychiatry the following work was undertaken.

72 male cases, patients at the City of London Mental Hospital, suffering from different forms of mental/

mental disorder, were selected for the purpose. One half of these were cases of Dementia Praecox.

The blood was withdrawn, as described below, in each case three hours after the mid-day meal, to obtain as nearly as possible standard conditions, and the S.V. estimated. The amount of previous exercise could not be controlled so satisfactorily, but in no case was it severe, and in all of the cases examined its influence was probably negligible - the patients for the most part sitting about in the ward from the time of the meal to the time of the withdrawal of the blood.

In addition the blood of 21 healthy males (male nurses with one exception) was examined under similar conditions. It was distinctly unfortunate that a much larger number of healthy males was not obtainable, but the small number examined represented the total of volunteers from a small staff.

Before proceeding to a discussion of the literature it is necessary to consider the technique employed.

TECHNIQUE.

There are three principal methods of performing the Sedimentation Test; but nearly every worker has evolved a special method of his own, for the most part a modification of one of the three main methods.

The principal methods are :-

I. The WESTERGREN-FAHRAEUS Technique.

II. LINZENMEIER'S "

III. ZECKWER AND GOODELL'S "

In addition, FAHRAEUS and others have employed micro-methods. To give a complete description of every method which has been employed would be irrelevant. It may be remarked that as in the case of many other laboratory procedures in Medicine, there has been a distinct tendency towards progressive simplification in the methods of carrying out this test, since FAHRAEUS first introduced his method. As the results of this investigator are given in some detail below it will be as well to indicate his method. He employed tubes 17 cm. long and about 9 mm. in internal diameter, with a mark at 10 cc. situated about 2 cm. distance from/

from the mouth of the tube. As anticoagulant he used Sodium Citrate solution of 2% concentration. Blood obtained from an arm vein was brought in contact with the Citrate and the contents mixed by inversion. The total height of the blood and citrate column was about 150 mm. Readings were made at the end of the first hour, the height of the clear layer of plasma above the corpuscles being measured and the results expressed in mm. In rapidly sedimenting bloods, the line of demarcation between cells and plasma may not be clearly marked, in which case the reading is taken at the lower end of the transition zone, i.e. at the place where the blood column is quite opaque (this applies to all methods). This method was modified in some respects by WESTERGREN and the technique is now generally known by the combined name.

LINZENMEIER'S method will not be described as it is similar in all essential respects to that used by BOCHNER AND WASSING described below, where the minor differences between the two methods will be indicated.

ZECKWER AND GOODELL'S method will be described briefly, as one of the methods used by the writer (COOPER'S) resembles it very closely. Ordinary 15 cc. glass centrifuge tubes, graduated in tenths of a cc. are used. Into each tube is placed 2 cc. of a 3% Sodium/

Sodium Citrate solution. Blood obtained in the usual way is allowed to run in up to the 10 cc. mark, the contents are mixed by inversion and the tube allowed to stand vertically in a rack, the time is noted, and a reading is taken at the end of one hour. In this method the height of the column of red cells is read and not the height of the column of supernatant plasma.

The present writer employed two methods, the one described by COOPER, the other by BOCHNER AND WASSING, the relative merits and demerits of which are discussed below.

In COOPER'S method blood is drawn into a bottle in which 3 drops of a 20% solution of Potassium Oxalate have been allowed to dry. 5cc. of this blood are transferred to a graduated glass centrifuge tube as used in ZECKWER AND GOODELL'S method, the tube is then stood vertically, the time noted and readings are taken at the end of 5, 10, 15, 30, 45, and 60 minutes. The results may be plotted in a graph, in which the ordinates represent the height of the column of cells and the abscissae the time in minutes. The writer used this method as described, varying it in no essential particular, only a beaker was used instead of a "bottle".

It must be pointed out, however, that COOPER was not the first to adopt this method of estimating sedimentation velocity, for GILBERT and TZANCK, a year or two previously, described a similar method in which they used small tubes 5 cm. high, graduated in tenths of a cc. in which they placed 5 cc. of blood, using Sulphursenol (1 c.c. in 2 drops water) as anticoagulant. They read the tubes every five minutes for one hour and charted their results.

In BOCHNER AND WASSING'S method, small tubes like centrifuge tubes are used. These are of 6 mm. internal diameter and hold a little over 1 cc. A mark is made at the 1 cc. level and the tubes are graduated downwards from this mark into lines of 3 mm. distance apart (linear measurement) for 18 mm. To this tube is added 0.2 cc. of a 2% Sodium Citrate solution. 1 cc. of blood is withdrawn from a vein into a dry syringe or syringe rinsed with citrate and is immediately transferred to the citrate in the tube, drop by drop to prevent the formation of air bubbles and the contents mixed by inversion or by drawing them up and down several times by means of a fine pipette. The authors recommend this latter procedure, as they say it ensures thorough mixing without/

without loss of any fluid. The tube is now placed in a rack in the vertical position and the time noted. The time required for the column of blood cells to reach line 12, i.e. when the column of supernatant plasma is 12 mm. in length, is noted. It will be observed, that in this method, it is the time taken for the cells to reach a certain level which is recorded.

In LINZENMEIER'S method which, as stated, is practically the same as the above, the tubes are 3-4 mm. in internal diameter and about 6.5 cm. high. 5% Sodium Citrate solution is employed and in this method 0.2 cc. are drawn into the syringe and the contents mixed there. The marks on the tube are at 6, 12, and 18 mm. Line 18 is used. By this method it is stated that in the normal individual it takes between 250 and 300 minutes for the red cells to reach line 18 (BEAUMONT and DODDS). BOCHNER AND WASSING, however, point out, that although line 18 is the popular standard, they prefer line 12 for the following reasons: The most marked sedimentation velocity occurs up to line 12, from then on sedimentation becomes gradually slower. Further line 12 is often the lowest limit reached in two hours in many cases of retarded sedimentation and point out that in clinical work speed

without/

without sacrifice of accuracy is manifestly an asset. They stated that using their method, in the normal subject, the time taken for the column of red cells to reach line 12 is 130 minutes or over, and using line 18, 600 minutes or more. These authors also record their results graphically, with the sedimentation readings as abscissae and the time reading as ordinates. For standardisation of method, they recommend the use of the ratio of the S.V. found, to that of the normal for the same sex, and give as an example, in a case of acute appendicitis female, line 12 in 12 minutes. The average of healthy women by the same method is 130 minutes, therefore the sedimentation ratio (S.R.) = $\frac{1}{13}$.

The tubes described by these writers are, as might be expected, unobtainable in this country, however, a number of such, strictly according to the above specifications, were made by Messrs. Baird & Tatlock, London. A stout metal rack for holding them was also constructed.

Certain modifications were introduced into the above method by the present writer. Small 1 cc. syringes, rinsed with sterile citrate solution as described, were at first employed, but although wide bore needles were used, considerable/

considerable difficulty was experienced, through the blood clotting in a large number of cases, either in the syringe, or in the tube and the patient not infrequently objected to having a second sample withdrawn. Accordingly, it was tried collecting the blood directly into the tube and it was found that with a little practice, the 1 cc. mark could be attained with considerable accuracy, no trouble being experienced with air bubbles. The blood and citrate, moreover, were mixed by inversion, this proving completely satisfactory. Line 12 was adopted as the standard. A Maclean's blood sugar pipette (0.2 cc.) was employed for measuring the citrate.

Before leaving the description of this method, however, it will be well to give the observations of WINGFIELD and GOODMAN, whose clinical findings are commented upon below, respecting the alteration in the reading observed when different proportions of blood and citrate are used in the same specimen. They find that any decrease below 80% of blood tends to produce a sedimentation rate which approximates to normal even in an abnormal condition. It may be remarked that FAHRAEUS made essentially the same observation, if plasma be concentrated, the suspension stability of the blood is reduced, but if diluted with Ringer's solution, it is increased.

A few remarks respecting the withdrawal of the blood may be made. FRIEDLAENDER stated that the blood should be withdrawn without stasis, "or the blood will contain too much carbon-dioxide or relatively too many blood-cells which will have a bearing on the time of sedimentation". Ito found that O_2 retards sedimentation of the erythrocytes and CO_2 hastens it. Consequently in withdrawing the blood, the tourniquet was removed as soon as the vein was entered, though it appears doubtful to the present writer if a long or a short application of the tourniquet makes much difference, for in some cases, although the tourniquet could only have been applied for about one minute at the most, a relatively large erythrocyte volume, as ascertained by subsequent centrifugation together with a slow S.V. were obtained, whilst in another case, Case II, below (Dementia Praecox) the tourniquet was applied for about ten minutes on each occasion the blood was withdrawn, on account of extreme difficulty in entering the veins, and the S.V. was found markedly accelerated on each occasion, together with a relatively low cell volume.

Having given a description of the methods employed by the writer, we may now proceed to discuss their relative merits and demerits. COOPER'S is unquestionably the simpler of the two methods and has been/

been preferred by the writer for the reasons set out below.

Firstly, the whole test can be completed in one hour, a great advantage where time is limited. Secondly, the liability to clotting of the blood by this method is minimal, and thirdly, as pointed out by COOPER himself, there is no dilution of the blood. On the whole, however, it must be admitted this last-mentioned feature does not constitute a serious objection to the other methods, as the dilution is constant in each case and the results are comparable among one another. Its disadvantages are that a relatively large quantity of blood (5 cc.), often difficult to obtain in the case of children and in many psychotics, is required, and also the method is rather a dirty one. On the other hand, in LINZENMEIER'S method and its modifications, as performed in the standard way at least, these last two disadvantages are absent. LINZENMEIER'S technique and its modifications, however, possess the disadvantage that constant watching of the tubes is required, and the time consuming nature of these methods, especially if line 18 be used, is obvious. The tendency of the blood to clot, at least, in BOCHNER AND WASSING'S modification, is a much more serious drawback.

LINZENMEIER'S technique is, perhaps, seen at its worst in rapidly sedimenting bloods, where the critical/

critical line is often passed in the twinkling of an eye, rendering exact observation difficult; and further in very slowly sedimenting bloods, it is impossible, unless the tubes are continually watched - a wearying procedure - to say how long precisely the column of red cells has been standing opposite a given line, but it must be mentioned, that in this type of case, exact observation is unnecessary as at the end of 130 minutes the blood column is often no lower than line 6 and the S.V. is clearly seen to be within normal limits.

On superficial consideration, LINZENMEIER'S and similar methods, appear to possess one outstanding advantage. That is, that the result can be expressed in relation to an apparently well established normal figure, and at first sight this advantage would seem difficult to override, but to this a certain amount of criticism may be offered.

BOCHNER AND WASSING in their article display a curious reticence as to the number of controls they examined. They simple state that the normal figure is 130 minutes for line 12, and do not lay stress on sexual differences (S.V. is more rapid in females than in males) and one is left wondering as to which sex

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is meant by the "normal" figure they give, for, as mentioned in describing the use of the test clinically in appendicitis, they seem to imply that the average normal for the female is 130 minutes - to line 12, therefore for the male the time would be somewhat greater. (See below).

BOCHNER AND WASSING'S figures for line 18 in normal individuals is/a stated, 600 minutes or over. FRIEDLAENDER, who investigated over 300 normal individuals (Using tubes 5 mm. in diameter, that is 1 mm. less than Bochner and Wassing's tubes), gives 1000-1200 minutes to line 18 in healthy males, and 600-1000 minutes to the same level in healthy females. Now sedimentation is slower the narrower the internal diameter of the tube employed, an occurrence noted by the present writer, who contrasted the rate of sedimentation for the same specimen of blood in 5 cc. graduated cylinders and in the wider centrifuge tubes, when the S.V. was found to be very much slower in the cylinder, therefore BOCHNER AND WASSING'S figures for line 18 should be slightly lower than FRIEDLAENDER'S. Further it will be remembered that in LINZENMEIER'S tubes of 3-4 mm. in diameter, the figures given are 250-300 minutes to line 18 in the normal subject.

Of course the difference in concentration of

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the anticoagulant, 2% Sodium Citrate in BOCHNER AND WASSING'S method, 5% in the two last may play some part.

Be that as it may, a consideration of the foregoing tends rather to shake one's confidence in the hard and fast figures which BOCHNER AND WASSING give for the normal.

Further, what is to be said of a figure just under 130 minutes, $\frac{129}{130}$, for instance, is this to be regarded as an abnormal figure and apprehension be aroused in consequence? If as CHERRY asserts, the sedimentation velocity is often disproportionately rapid to the severity of an infection and causes needless alarm, (and all are agreed as to the sensitiveness of the reaction in these cases), is this not a further disadvantage to LINZENMEIER'S technique, and is it not desirable in consequence to use a cruder method such as COOPER'S or ZECKWER AND GOODELL'S (where according to the latter authors, only gross differences are to be taken into account), the sensitiveness of the reaction by such methods being "damped down" as it were? It seems so at any rate to the writer, who finds in this, instead of a cardinal drawback to COOPER'S method a distinct advantage, removing the only recommendation, which apart from/

from the relatively minor ones mentioned, LINZENMEIER'S and similar methods seem to possess. The considerable discrepancies to be noted between LINZENMEIERS, FRIEDLAENDER'S and BOCHNER AND WASSING'S figures for line 18, in the normal subject, are suspicious, even allowing for difference in calibre of tubes and concentration of anticoagulant.

A considerable number of tests were performed using BOCHNER AND WASSING'S method, but the results are not given, as side by side, with the others they might give rise to confusion. Further it was felt in view of the facts stated above that the method was not sufficiently reliable. An interesting point brought out when the S.V. of the same sample of blood by both methods was determined, was that figures which one might legitimately regard as within normal limits by COOPER'S method, had a sedimentation time by BOCHNER AND WASSING'S method of under 130 minutes for line 12. This would seem to lend further support to the view that this latter method is on the whole too delicate, and also, like all delicate methods correspondingly easy to upset. In COOPER's method, of course, until a sufficiently large number of controls have been examined, it is difficult to say exactly what is a "normal" reading, wide variations

being/

being observed, as will be seen from COOPER'S figures, for the normal
/though not in those of the present writer's. These variations doubtless depend as FAHRAEUS has suggested on differences of age, etc. in the various subjects, not forgetting that many individuals probably give a constantly low figure under normal conditions, in other words, as ZECKWER AND GOODELL have remarked, there is no sharp line of demarcation between the normal and the diseased and hence as these authors have said, it is not justifiable to lay stress on small variations from the normal. With this the present writer is in agreement. Indeed it is only when the fall of the cells is sudden and dramatic that any conclusions can be drawn from observations of the Sedimentation Velocity. This is one of the most outstanding limitations of the sedimentation test. Against COOPER'S, and of course also ZECKWER and GOODELL'S technique it might be urged, with some justification, that the obvious differences in calibre and even in shape of different centrifuge tubes might alter the rate of fall and hence the hourly reading. This is, to some slight extent, the case, but in view of the foregoing statements concerning small variations, and also because the difference rarely amounts to more than a/

a millimetre or two this may safely be disregarded and for clinical purposes it would appear to be unnecesary to calibrate the tubes. In a considerable number of cases using tubes of obviously different calibre, the hourly reading was identical for the same specimen of blood. ZECKWER AND GOODELL also hold that differences of a few millimetres are of no importance in this connection.

In performing the test it is hardly necessary to state that blood which has partially clotted, or in which one or two clots due to the slow exit of blood from the needle have formed, is useless for the test. In several cases such bloods, the earlier portions of which coming in contact with the exalate had been rendered incoagulable, but in which the later, slowly dropping portions had coagulated were used for the tests, the rate of sedimentation was always more delayed than in a completely fluid sample.

Although COOPER in his paper appears to be of the opinion that, whilst it is better to perform the test at once, waiting for a few hours makes very little difference, the writer has not found this to be the case. There is a slight diminution of the sedimentation rate when the test is performed with the same sample some hours after the withdrawal of the

blood/

blood, and in one case, where the same blood was set up 28½ hours after withdrawal, no sedimentation occurred at all,* the hourly reading on the first occasion, when the observation was made at once, was 4.1 cc. The blood was one of the controls, and had been allowed to stand in its beaker during this period and was reshaken. It is thus desirable to perform the test almost immediately after taking the blood. Concerning reshaking, it is said by FRIEDLAENDER and others that a neglected specimen should be reshaken and re-observed. This has not been found practicable as complete mixing of the cells and plasma citrate could not be obtained.

The slow fall at first observed by Fahraeus and others, gradually accelerating to slow up again, has also been observed by the writer. In passing, it may be remarked that one of the objections to the Fahraeus method is that his tubes are too narrow, capillary attraction coming to play a part in the phenomenon. COOPER thinks the tubes used should not be less than 5 mm. in internal diameter. ~~The significance of this will appear later.~~

* Normal serum completely loses its power of producing rouleaux formation of red cells in about 24 hours at room temperature and the red cells after standing 6-9 hours at room temperature also lose their power of being grouped in rouleaux. (SWIFT). The significance of this will appear later.

Some remarks should also be made on the question of the temperature at which the test is performed. This has been studied by several, including ALEXANDER. This author in his paper states as the result of experiments carried out by him, that Sedimentation proceeds fastest at body temperature. At room temperature (20°C) he found the S.V. to be 80% of that at 37°C, at 45°C no sedimentation occurred at all, and at 0°C it was very slight.* He states that room temperature is best for clinical purposes. FRIEDLAENDER makes the same statement. In view of the above, it would appear desirable to carry out the test at a constant temperature as far as possible. Fortunately, in the laboratory in which the following observations were made, the room temperature, owing to the method of heating, showed very little change from day to day, even in the warmer months.

ALEXANDER also investigated the effect of the H-ion concentration of the blood on the rapidity of sedimentation, but found that fairly wide variations failed to either accelerate or retard it. DE COURCY again thinks that a deviation of the tubes from the

* SWIFT found that heating of normal serum greatly enhances its power of forming rouleaux.

vertical position, even less than 10°, modifies the rate of sedimentation, especially in the first hour.

In conclusion if this test has any value in practical Medicine, it seems highly desirable, as stressed by so many authors, that some standard method of performing it be universally adopted to permit of direct comparison of the results of different workers. In the present work the aim has been less to ascertain the best method to employ than to endeavour to ascertain the value of the test in psychiatry, and, in the event of constant results being obtained, to reconsider the question of the technique.

LITERATURE.

Having now discussed the question of technique, it is necessary to consider the researches of others, particularly in their clinical relationships.

As indicated in the introductory section, this test has been applied in different departments of medicine. For the sake of convenience, the use of the Sedimentation test will be discussed under the different headings of Obstetrics and Gynaecology, Surgery and Medicine.

The Sedimentation of Erythrocytes in Obstetrics and Gynaecology.

I. A. Obstetrics.

FAHRAEUS observed the Sedimentation Velocity to be increased in pregnancy, the velocity increasing as pregnancy advanced, attaining its highest value at term and remaining increased for at least the first two months after delivery. He investigated the blood of 32 pregnant women in different stages of the condition, (reckoned from the time of the last menstruation), employing his own technique described above and taking an hourly reading. His figures were as follows :-

	Average.
1st month	6 mm. per hour
2nd "	17.4 " " "
3rd "	23.8 " " "
4th "	20.7 " " "
5th "	29.2 " " "
6th "	33.3 " " "
7th "	40.7 " " "
8th "	47.0 " " "

His average figure at term was 44.9 mm.

He also examined the blood of 19 women in the first two months after delivery and obtained the following average figures :

1st month	41 mm. per hour
2nd "	19.5 " " "

He found therefore a reduction of the Suspension Stability of the blood already in the first months of pregnancy and

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and for at least the first two months after delivery. In some of the cases of pregnancy he examined the figures obtained were within normal limits. The following were his findings in normal healthy men, normal healthy non-gravid women and new-born children:

	Average.
Normal healthy males (82 subjects)	3.3 mm.p.h.
" " non-gravid women (61 subjects)	7.4 " "
New-born children	0.5 " "

He places the limit for healthy men between 9 and 10 mm. per hour and for healthy non-gravid women between 12 and 13 mm. It is seen from the above that normal women have a lower "Suspension Stability" than normal men. He considers that different groups of individuals are distinguished by different values of sinking velocity and that the classification of the groups is regulated by age, sex and physiological condition. It must be added that he included no case with fever or albuminuria amongst his cases of pregnancy.

Since the publication of the above, his general conclusions have been widely confirmed. The majority of later observers, however, seem to be agreed that the degree of increased sedimentation velocity in the first three months of pregnancy is absent or negligible. Thus VIGNES considers that the differences between the sinking rates in the first three months of pregnancy

and/

and those of the normal non-gravid woman are insignificant, and that even in the second trimester the results are inconstant.

The unreliability of the test in the first three months is also mentioned by FRIEDLAENDER, and BOCHNER and WASSING amongst others.

The Sedimentation Velocity is also said to be slightly increased during menstruation (ZECKWER and GOODELL, DE COURCY).

(b) Gynaecology.

FAHRAEUS' figures in various gynaecological conditions are as follows :-

Salpingo-oophoritis, pelveo-peritonitis	F. 45	mm. p.h.
" " " "	F. 53	" "
" " " "	F. 63	" "
" " " "	F. 75	" "
Carcinoma Uteri	F. 31	" "
" "	F. 88	" "
Myoma Uteri	F. 10	" "
" "	F. 8	" "
" "	F. 12	" "
" "	F. 15	" "
Kystadenoma demiordes torquata	F. 26	" "
" " "	F. 38	" "

As will be seen from the above, the values for myoma uteri are within normal limits or are only slightly above normal. The above general findings in gynaecological conditions have been confirmed as widely as his findings in pregnancy.

The next step was to ascertain to what extent

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this phenomenon was of value in the clinic. A brief account of its use in gynaecological practice ensues.

Before discussing the work of the different authors, however, it must be borne in mind as already stated that nearly all of them have employed different techniques, that of LINZENMEIER, already described, or one of its modifications being the most popular.

FRIEDLAENDER who gives a admirable account of the clinical application of the Sedimentation Test in gynaecology, after confirming the existence of increased S.V. in a large number of gynaecological conditions concludes that the "test" is of definite value in this department of practice. (He examined the blood of 1020 patients suffering from gynaecological conditions). For example he has found it to be of especial value in those cases of adnexal disease where there is a latent infection with a normal temperature and normal blood count. He considers a rapid sedimentation a sign of infection and has come to place considerable reliance on the test as an indicator of the safe time for operation, a normal value indicating a sterile field, when operation in these cases can be safely undertaken. He states that no surgical interference should be attempted until the S.V. has been ascertained. He finds with Fahraeus that tumours such as simple non-

inflammatory/

inflammatory myomata have a normal sedimentation time and in addition cysts and dermoids, while large myomata, ovarian cysts with twisted pedicle and "tumours with a tuberculous tendency" show a rapid sedimentation time. He considers that this test is of more value than the temperature chart, blood count, and uric acid content of the blood as an indicator of infection and/a more accurate method of determining the absorption of foreign proteins than Widal's haemoclastic crisis. Using LINZENMEIER'S method with line 18, he gives the following figures, under 30 minutes, means an active infection and under one hour a latent infection, whilst a sedimentation time of over two hours excludes all possibility of a latent or active infection. He considers the test of value in the diagnosis and prognosis of gynaecological conditions.

BOCHNER AND WASSING state that the test is of great value in the diagnosis between inflammatory disease of the adnexa and tubal pregnancy, for in an uncomplicated tubal pregnancy for the first two or three months they state that the S.V. is normal, unless slight reactive changes of the peritoneum have taken place, or an intra-ligamentous haematoma has formed, whereas in adnexal inflammation/

inflammation the rate is increased. They believe that a repeatedly normal S.M. rules out the presence of an active or latent inflammatory or degenerative process and further that the test can be used with absolute reliability at the bedside, in place of a leucocyte count.

These authors are of the opinion that the S.V. seems to correspond more to the type of organism and the resistance of the patient than to the degree of catabolism and protein absorption.

BAER and REIS carried out 192 tests in 100 gynaecological cases. They used Linzenmeier's technique (line 18). They reached the following conclusions. That the Sedimentation Test is useful in determining the presence or absence of infection in the body and state that a sedimentation time of over two hours conclusively rules out pelvic infection; that the rate of sedimentation is directly proportional to the virulence of the infection; that the test is a further aid in determining the safe time for operation and that the sedimentation test seems a more valuable prognostic index, good or bad, than either the temperature chart or leucocyte count.

FROSCH, using Linzenmeier's technique with line 18, is also agreed as to the value of the sedimentation test as an indicator of the time of safe operability in gynaecological/

gynaecological cases, and states that the test should be used especially in those cases which have a normal temperature and blood count.

SCHMITZ and SCHMITZ, however, whilst admitting that the test is of value in differentiating certain gynaecological conditions, are disposed to lay more stress on clinical observations, and believe that blood analysis and temperature records give more reliable information about the time of safe operability in adnexal conditions than the sedimentation test and quote VOEK in support of this. There authors, however, examined only a relatively small number of cases (80).

CHERRY also considers the leucocyte count to be of more value than the sedimentation test in the diagnosis of mild infection, as he found the S.V. disproportionately rapid in some cases of mild infection, where the leucocyte count was not high, and hence was a better indicator of the time to interfere surgically than the sedimentation test, which latter he believes, however, to be "a most delicate indicator of the invasion of the human organism by disease". He considers that it would be unwise to base a prognosis on this one test unless substantiated by other reliable clinical manifestions. More recently, however, SMILEY commenting on the above writer's results has difficulty in understanding them, as Cherry's is one

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of the few dissentient voices in regard to the value of this test in gynaecology. Smiley's results were in conformity with those of the majority; but whilst agreeing that the test is of value, admits that the sedimentation test should not replace careful observations of the temperature curve and repeated examination of the leucocytes. He states also in common with some others that an increased S.V. is often present before any change is noted in the count and gives better and earlier information between resistance on the one hand and virulence on the other. Speaking of its occurrence in pregnancy, this author states that a rapid S.V. is valueless in the diagnosis of this condition in the early stages.

Some of its applications in Surgical practice may now be considered.

II. Surgery.

Fahraeus gives the following results in these surgical conditions :-

	1. Septicaemia	F	.. ..	95	mm. per hour.
	2. "	M	.. ..	105	" " "
Surgical Tuberculosis	3. Tuberculosis of kidneys	M	.. ..	14	" " "
	" " "	F	.. ..	14	" " "
	" " "	M	.. ..	23	" " "
	" " "	F	.. ..	24	" " "
	" " "	M	.. ..	25	" " "
	" " "	M	.. ..	60	" " "
	" epididymis	M	.. ..	12	" " "
	" "	M	.. ..	23	" " "
	" "	M	.. ..	48	" " "
Alimentary Tract.	4. Duodenal Ulcer	M	.. ..	4	" " "
	Gastric "	M	.. ..	21	" " "
	" "	F	.. ..	55	" " "
	Appendicitis	M	.. ..	13	" " "
	"	M	.. ..	19	" " "
	"	M	.. ..	40	" " "
	"	M	.. ..	42	" " "
	Chronic peritonitis (chronic ileus ?)	M	.. ..	79	" " "
Diseases of Bones and Joints.	4. Tendovaginitis	M	.. ..	82	" " "
	"	M	.. ..	85	" " "
	Osteomyelitis	M	.. ..	85	" " "
	"	M	.. ..	95	" " "

Diseases of the Skin.	5.	Panaistium	F	..	..	56 mm. per hour.
		Furunculus	M	..	..	18 " " "
		"	M	..	..	25 " " "
		Abscessus Nuchae	M	..	..	74 " " "
		" "	M	..	..	99 " " "
		Folliculitis Axillae	M	..	..	55 " " "
		Phlegmone Femoris	M	..	..	74 " " "
Diseases of the Ear.	6.	Otitis Media	M	..	..	25 " " "
		Mastoiditis	M	..	..	37 " " "
Tumours.	7.	Sarcoma Femoris	M	..	..	8 " " "
		" duraematris	M	..	..	10 " " "
		Carcinoma linguae	F	..	..	23 " " "
		" ventriculi	F	..	..	20 " " "
		" recti	M	..	..	3 " " "
		" "	F	..	..	12 " " "
		" "	F	..	..	13 " " "
		" "	F	..	..	14 " " "
		" "	M	..	..	16 " " "
		" "	M	..	..	53 " " "
		" Vesicae urinariae	F	..	..	28 " " "
		" prostatae	M	..	..	50 " " "

			No. of 24 hrs after Fract.	Stab. Reaction.
Non-Complicated Fractures.	Fract. Mall. lat. et med. dex.	F	1	12
			5	31
			10	32
	Fract. fib. sin.	M	0	3
			3	24
	Fract. humeri sin.	M	23	20
			36	3
Operations.	Ulcus Duodeni - Gastro-enterostomy	M	0	4
			7	25
			11	6
	Hydrocele Testis. Rad. opn.	M	0	2
			2	24
			5	22
	Hydrocele Testis. Rad. opn.	M	0	5
			4	29
			7	16
			9	16

LÖHR examined 100 uncomplicated fractures and found an increased rate in all cases. In the most severe this was noted after 12 hours, but always after 24. He considers the test may have some value in surgery.

ALEXANDER found that in tuberculous cervical adenitis without secondary infection, the S.V. did not seem altered from the normal. The same holds true, he states,

of/

of the kidney in early stages of tuberculosis (cf. Fahraeus' results in this condition). He, however, only examined two cases of this condition and only eight of the former.

NEES found a rapid rate in tuberculosis of the kidney depending on the amount of tissue destruction.

RUBIN considers that the test has little diagnostic value in Surgery, and cites a case of duodenal ulcer which gave a low reading, in spite of the anaemia which in itself is a cause of more rapid sedimentation. He considers, however, that the test is a more reliable indication of the condition of a patient than the temperature or leucocyte count, and that the return of the S.V. to a normal rate after operation is slower than the return to normal of the temperature.

HALLBERG applied the Sedimentation Test in laparotomy and thyroidectomy cases and considers the test a more reliable and sensitive index of the severity of the process than the temperature. A rise occurred in cases operated upon under a general anaesthetic, reaching its height about the second, third or fourth day and then declining to reach the normal figure about the twenty-second day. The rise was insignificant under local anaesthesia and under general anaesthesia without cutting.

In Surgery the reaction has been used to differentiate between acute appendicitis and acute adnexal disease, in the former it is stated (MORRISS and RUBIN) that the S.V. remains normal for the first 30 hours, whilst in the latter it is always accelerated.

NEES again, states that uncomplicated acute appendicitis gives practically normal figures. His findings in the cases of fracture were similar to those of the above writers, an increased S.V. occurring after 24 hours.

We may now consider the results obtained in medical conditions.

FAHRAEUS' figures are as follows in the diseases indicated:

				mm. per hour
Erysipelas	M	..	..	80
Diphtheria	F	..	..	38
"	F	..	..	40
Scarlatina		..	..	20
Typhus Abdominalis	2nd week	F	..	23
" "	4th "	F	..	49
" "	6th "	F	..	20
" "	" "	F	..	42
" "	7th "	M	..	33
" "	8th "	F	..	25
" "	" "	F	..	39
" "	" "	F	..	75
" "	11th "	M	..	60
" "	19th "	M	..	7
Tuberculosis of Lungs		F	..	27
" "	"	M	..	40
" "	"	M	..	60
" "	"	F	..	65
" "	"	M	..	85
" "	bones and joints	F	..	7
" "	"	M	..	22
" "	"	M	..	69

				mm. per hour.
	Acute Bronchitis	M	.. ..	12
	Pneumonia Crouposa	F	.. ..	50
	" "	M	.. ..	53
	" "	M	.. ..	68
	" "	M	.. ..	75
	" "	F	.. ..	80
	Pleuritis	M	.. ..	49
	"	M	.. ..	66
	Acquired Syphilis	M	.. ..	28
	" "	M	.. ..	60
Diseases of the Blood.	Anaemia	F	.. ..	53
	" Pernicious	M	.. ..	37
Metabolic Diseases.	Diabetes Mellitus	M	.. ..	11
	" "	F	.. ..	55
Diseases of Organs of Circulation.	Acute Endocarditis	M	.. ..	45
	" Vitium organicum cordis	M	.. ..	17
Diseases of Kidneys.	Acute Glomerular Nephritis	M	.. ..	46
	" " "	M	.. ..	56
	" " "	F	.. ..	60
	Pyelocystitis	F	.. .. ..	15

General Medicine.

POPPER and KREINDLER employing Westergren's technique obtained the following general results. They found the S.V. accelerated in haemolytic jaundice, pernicious anaemia (2 cases), diabetes (2) and Basedow's disease (2), acute nephritis with oedema, tumours, syphilis and infectious processes, the rate running parallel with the severity of the infection. Cases of acute and chronic rheumatism in their series also showed an increased sedimentation velocity, the degree being more marked in the acute cases. Their findings in diseases of the liver are interesting. They divide the cases into two groups (1) Where the S.V. is diminished (2) Where it is increased. In the first case there is a diminution of the amount of fibrinogen in the plasma owing, they state, to abrogation of the fibrinogenetic function of the liver. In the second series there is retention of biliary salts in the plasma leading to increased S.V. by lowering surface tension. In the second group there was a normal or exaggerated amount of fibrinogen in the plasma. The first group is thought to indicate cases of damage to the liver parenchyma, in the second, interstitial processes, neoplasm, etc. are considered to represent the type of morbid/

morbid change. In chronic cardiac and renal affections they found the S.V. normal or only moderately accelerated, but when decompensation occurred in the former, the speed of settling was markedly increased. These writers are of opinion that the "reaction" is of real value in the clinic.

ALEXANDER found the S.V. increased in 10 cases of acute arthritis (acute articular rheumatism), 4 cases of facial erysipelas, 12 cases of lobar pneumonia and 3 of acute tonsilitis in his series. His findings in pulmonary tuberculosis are reserved for inclusion under that head, since the use of the test in that condition has been so extensive that it is desirable to consider it under a special heading.

DE COURCY found the rate increased in cases of toxic goitre, but not in non-toxic cases, and in other medical conditions, and he considers the method to be a valuable aid to diagnosis when combined with other methods and also an accurate check to prognosis. He considers that its scope may be widened with further study.

NEES found normal rates in hyper and hypo-thyroidism.

Enough has been said concerning the test in general/

general medicine; it is necessary to consider now what has been and still is probably its widest clinical application, namely to cases of pulmonary tuberculosis.

B. Tuberculosis.

WESTERGREN considers that the test in this condition can have a diagnostic value and stated that in the presence of a normal Suspension Stability, an active phthisis can most probably be excluded. He considers further that valuable inferences as to prognosis may be drawn from this test, which he considers to be "decidedly more valuable than the measurement of the temperature," as a gauge of the activity of the process.

FAHRAEUS' results in tuberculosis have already been given.

POPPER and KREINDLER obtained positive results in tuberculosis according to the stage of the pathological process, the more advanced cases showing a more rapid rate.

LEVINSON found the test a useful aid in the diagnosis and prognosis of tuberculosis, throwing light on the activity and progressive nature of the disease process. The same investigator elsewhere found that the temperature, the pulse, the plasma toxicity and the/

the Suspension Stability of the blood in tuberculosis are parallel.

MORRISS in a study of 150 patients found that there was a definite increase of the rate in active pulmonary tuberculosis, that it was a valuable means of estimating the degree of activity, but not the extent of the lesions, but that the test had little value in the diagnosis of tuberculosis.

In France, GARDÈRE and LAINÉ in a series of cases of pulmonary tuberculosis in children found the sedimentation more rapid in cases with gross pulmonary lesions pursuing a rapidly progressive course. These authors appear to think the extent also, of the lesions, can be gauged by the speed of sedimentation. They speak favourably of the test in the diagnosis and prognosis of this disease.

ALEXANDER in 22 active cases of this disease found the S.V. accelerated. In 12 healed or completely arrested cases of the same, the S.V. was normal. His results in certain cases of tuberculosis elsewhere in the body have been given above under Surgery. He considers that further investigation is necessary to determine the value of the Sedimentation Test in tuberculosis.

BOCHNER and WASSING state with Westergren that "A repeated normal S.V. rules out the presence of active tuberculosis," and they consider it a reliable aid to prognosis.

ZECKWER and GOODELL found the rate increased in tuberculosis and consider that the test has a definite value in diagnosis and prognosis when used in conjunction with other procedures.

DE COURCY, writing of the test in pulmonary tuberculosis, states that the increased sedimentation appears earlier than the temperature elevation and disappears after the temperature has become normal. He appears to place confidence in this procedure, as a gauge of the amount of physical activity to be allowed to tuberculous patients.

The Rate of Sedimentation, however, would not appear to be increased in every case of active pulmonary tuberculosis, some of MORRISS' patients with cavities did not give a high reading, and in a case reported by BEAUMONT and DODDS, in which tubercle bacilli were found in the sputum and the temperature varied from 97°F (morning) to 99°F (evening) while the patient was in bed, the Sedimentation figures, using Zeckwer and Goodell's method, were within normal limits.

WINGFIELD and GOODMAN also in their series of 156 cases found that while a definite case of chronic pulmonary tuberculosis usually gives an abnormal curve, "there is an error of at least 7% and in the less obvious cases the error may be over 50%." These authors conclude from their investigation that the test is of no value in the diagnosis of pulmonary tuberculosis, but believe that in prognosis it is of value under certain conditions of medical practice where close clinical observation is not possible as in e.g. the dispensary, private practice, etc. They also believe with Gardere and Laine that the S.V. mirrors the extent of the lesion, the greater this is, the more abnormal the rate. They strike an unfamiliar note, however, when they assert that the degree of abnormality of the S.V. is no indication of the patient's state at the moment, and that whilst an increase or decrease of rate is associated with deterionation or improvement of the patient's state this could always be predicted by careful clinical observation.

Before leaving this subject it is interesting to note that GILBERT, TZANCK and CABANIS found the S.V. increased in leprosy, being greater in the acute stages of the malady than in the chronic. They were

able/

able to investigate 6 cases of this disease.

Having briefly considered the clinical application of the test in the various departments of medicine, it is necessary to review how that section of the literature which is directly germane to the subject of this paper, namely the sedimentation velocity in the Psychoses.

C. The Psychoses.

FAHRAEUS in his investigation included 18 cases of various forms of insanity, but as he employed a micro-method, his results in these cases are not directly comparable with those which he obtained by his macro-method in other morbid conditions.

He states in his paper that employing this method values higher than 3 mm. for men and 4 mm. for women are to be regarded as definitely pathological. His results were as follows :

Imbecility	M	.. ..	½ mm.
"	M	.. ..	1½ "
"	F	.. ..	1½ "
Epilepsy	M	.. ..	½ "
Hysteria	M	.. ..	1 "
Dementia Praecox	M	.. ..	½ "
" "	M	.. ..	1½ "

Dementia Praecox	M	.. ..	1½ mm.
" "	M	.. ..	1½ "
" "	M	.. ..	2 "
" "	F	.. ..	2
" "	M	.. ..	2 "
" "	F	.. ..	5 "
" "	F	.. ..	8 "
General Paralysis	M	.. ..	1½ "
" "	M	.. ..	5½ "
" "	M	.. ..	8 "
" "	F	.. ..	8 "

PLAUT in 1920 reported on a series of 220 cases. He found an acceleration of the Sedimentation Velocity in cases of paralysis, syphilis and arteriosclerosis and found that the blood of paralytics sediments on an average six times as rapidly as the blood from cases of Dementia Praecox. He found the normally greater rate of S.V. of female blood over that of males to be maintained in the psychoses, but found this relationship reversed in syphilis. He found no progressive changes in the S.V. when the test was performed at intervals. His conclusions are that in male cases the majority of cases of syphilis, paralysis and arteriosclerosis are distinguished from the majority of cases

of/

of psychopathy, dementia praecox, melancholia and epilepsy by an accelerated Sedimentation Velocity. A comparison of the S.V. of the bloods of women suffering from paralysis and syphilis showed a greater disparity than the difference of S.V. obtained in these two conditions in men, i.e. the figures obtainedm from men in these two conditions were almost identical, the figures in women being much greater in paralysis.

W. RUNGE in a paper published a few months later reported on the S.V. of the erythrocytes in 86 cases of different forms of psychosis. His conclusions were that not only in paralysis, tabes, lues cerebri, and inflammatory processes in other regions of the body, but in a considerable proportion of cases of dementia praecox, the S.V. was increased. Some cases showed an abnormally slow rate for which he could find no reason. He holds that it can never be an aid to the differential diagnosis of these cases, as it occurs in some "functional" cases as well. He found here and there positive results in melancholia, hysteria and psychopathies. With regard to his findings in dementia praecox, an accelerated rate was found usually in typical catatonic, excitable and stuporose cases, but in paranoid cases was frequently missing, but stated that/

that definite rules could not be laid down. In restful hebe-phrenics it was not infrequently slow. In a severe case of stupor examined repeatedly he found a marked retardation of sedimentation, but found a progressive increase of the rate in hebe phrenia when the blood was examined at intervals of several weeks. In manic depressive cases he states that an increased S.V. may occur, but that sufficient cases of this disorder were not examined from which to derive any definite conclusions. In epidemic encephalitis he found the rate slightly increased. He mentions the importance of excluding bodily and organic disease in such an investigation.

GLAUS in a paper published in 1924 reported contradictory results in dementia praecox, but in catatonia especially in the acute stages, a relatively high acceleration, whilst in paranoid cases almost universally no acceleration. In epilepsy, none or only a moderate acceleration, immediately following a fit there was some increase in the rate. In manic depressive cases (almost exclusively melancholia) there was no essential acceleration, and similar results were found in psychopathy, neurasthenia and hysteria. In senile dementia on the other hand, the/

the rate was increased, being particularly marked in Alzheimer's disease. He obtained similar results in syphilis cerebri and in general paralysis, especially in advanced cases with "marasmus" and believes that an increased S.V. only occurs in active progressing cases and not in stationary ones. General paralysis he states further shows a much higher rate than an accidentally found non-florid syphilis. He stresses the importance of excluding bodily organic disease, which as he remarks is extremely difficulty in these cases, on account of the possible presence of a slight tuberculosis.

He quotes WUTH as being substantially in agreement with PLAUT in his findings in the psychoses.

JACOBOWSKY carried out this test in 112 male cases of dementia praecox. These cases showed a normal, or accelerated rate, the increase of S.V. being most marked in cases of greatest organic deterioration. He finds the reaction of no value in psychiatric diagnosis, but that it is one of the most certain indicators of far-reaching bodily disturbance.

PAULIAN and TOMOVICI investigated the S.V. in cases of nervous disease. They found an evident acceleration in tabes, nearly 56 times greater than in/

in the normal, and an acceleration was noted in general paralysis. In paraplegia they found the reaction useful in distinguishing between specific and non-specific cases, for where syphilis was an etiological factor, the rate was increased. In paralysis agitans the fall is sharp, and on this finding raise the question as to whether the disease has a specific origin. In post-encephalitic Parkinsonism on the other hand, the fall was slow, normal figures being obtained. They consider the reaction to be of importance in neurology.

POPPER and KREINDLER found that cases of tabes and general paralysis presented a normal S.V. and also found the rate normal in post-encephalitic Parkinsonism (2 cases).

ALEXANDER found the rate accelerated in his 20 cases of syphilis, but in his 6 cases of general paralysis the rate was most accelerated (cf. GLAUS).

BOCHNER and WASSING state that in post-encephalitis the S.V. is increased.

Lastly, as morphinism is generally held to be within the province of the psychiatrist, the observations of STERN-PIPER may be given. This observer investigating cases of this disorder found the S.V. accelerated in the majority of his cases, the rate undergoing a progressive retardation after/

after the drug was withdrawn. It is necessary to add, perhaps, that the majority of his cases were in poor strength and nutrition. He considers that the Sedimentation Test might be of value in the diagnosis of this condition.

In the foregoing review the conclusions as to the clinical utility of the Sedimentation Test reached by different observers in various departments of medicine have been given. Before proceeding to a discussion of these it may be convenient to give the following brief general summary - taken from BOCHNER and WASSING'S excellent article - of the conditions in which an increased rate of Sedimentation occurs.

The Sedimentation Velocity is increased in all conditions of increased protein catabolism, consequently in all febrile conditions; in many inflammatory conditions without fever; in pregnancy after the third month; after parenteral introduction of a foreign protein; after therapeutic X-ray treatment or influences of radio-active substances on the organism; in many kidney diseases due to the presence of certain higher products of protein catabolism in the blood, revealing themselves in the rise of a certain fraction of the

non-protein/

non-protein nitrogen; in liver diseases where there is a lack of normal protein catabolism present; in tumours where there is resorption of cellular products due to disintegration of the tumours; among other conditions without fever are active lues, general paralysis and all conditions with increase of red cells. He also includes Runge's findings in the psychoses, but as they contradict those of some other observers they will be omitted here. They mention an increased rate as occurring in arteriosclerosis.

From a consideration of the foregoing, the first and most obvious conclusion which can be drawn is that the test is in no sense specific for any one disease. Despite this obvious drawback, the general concensus of opinion is to the effect that at least in gynaecological practice and in pulmonary tuberculosis it has a distinct value. Nor indeed, according to some, is its usefulness limited entirely to those groups. In the diagnosis of pregnancy, at least in the earlier months, the value of the test appears to be inconsiderable and as it is just in those months that a positive diagnosis of this condition is perhaps most often required, its value as a diagnostic agent may be discounted altogether,

although/

although between the third and fifth months before auscultation is of any avail, the progressive increase in the rate observed when the test is performed at intervals, might turn the scale in favour of the physiological condition, various morbid processes being, of course, ruled out, for the majority of observers are agreed that uncomplicated myomata uteri give normal or almost normal results with sufficient frequency. Its value in pregnancy is thus extremely limited at the best. SMILEY, however, appears to consider that the extremely rapid rate of sedimentation observed at term might warn one that labour was imminent.

A negative test as elsewhere in medicine, is probably of much greater value, as indicating that at least no acute infections process is present in the organism, though, as will be shown below, at least in some cases, a grave degree of pathological change of a slowly progressive, sub-acute character may be present with a normal sedimentation rate.

On the whole then, despite the fact that much of the intense enthusiasm with which this reaction was first greeted, appears to have waned, it is still regarded/

regarded as possessing a definite utility in the differential diagnosis, and still more, perhaps, in the prognosis of gynaecological cases, and to have proved, in some hands at least, a valuable instrument in gauging the moment for successful operative interference. With regard to its superior utility compared with the leucocyte count, temperature chart, etc., it is probable that further work is required to establish this point, and as we have seen the two last named indicators of the general condition of the patient, are spoken of in no disparaging terms, and indeed, are regarded by some, as being superior to the estimation of the Sedimentation Velocity of the erythrocytes in this connection.

With regard to its value in tuberculosis little more need be said, the general opinion being that the test is of value, with many qualifications perhaps, and with whatever limitations it may possess. In general medicine again further work appears to be required before this test can occupy any definite place as a clinical aid. From a review of the literature in the psychoses, it was clearly impossible to draw any very definite conclusions, the results in the hands of different investigators having proved contradictory. Feeling that its position in this branch/

branch of medicine was not established the following work was undertaken with a view to ascertaining if this test, apparently so useful in other fields, was of any value in mental disorders, and if so, along what lines, whether in differential diagnosis, in prognosis, or as an indicator of the progress of the case?

LITERATURE.

Since writing the above, another paper dealing with this test in the psychoses has come to the writer's notice.

SIWINSKI found the S.V. increased in cases of progressive paralysis, imbecility, Amentia (?Acute Confusional Psychosis) ~~and~~ as well as in Dementia praecox cases chiefly catatonic, and in the Manic phase of Manic-Depressive Insanity.

THE CAUSATION OF THE PHENOMENON OF INCREASED SEDIMENTATION VELOCITY

The views as to the causation of the phenomenon may now be briefly considered. As yet no complete explanation is forthcoming. FAHRAEUS by a series of careful experiments was able to show that changes of viscosity of plasma, of specific gravities, or of size of corpuscles, play no part of any importance in the speed of sedimentation, and that the really important factor is the degree of agglutination of the erythrocytes. He first points out that mist, consisting of very fine particles of aqueous vapour, falls more slowly than rain, which latter falls faster, the larger the size of the drop, and that a similar state of affairs occurs in slowly and rapidly sedimenting bloods respectively. This agglutination depends on the presence of certain substances in the plasma, a fact which he demonstrated by carefully washing the corpuscles of a pregnant woman and transferring them to male plasma, and vice versâ.

His results are more conveniently demonstrated by the following table, thus expressed in words.

Suspended in	Rate of sedimentation of Male corpuscles.	Female corpuscles
Male plasma	4 mm. per hour.	10 mm. per hour.
Gravid "	55 " " "	62 " " "

/This

This investigator considers that the change in the plasma responsible for the agglutination is an increase of the easily precipitated protein fraction, which for the sake of brevity he calls "globulin increase."

Hafner found a relative increase of globulin in the plasma in pregnancy, the content sinking after birth.

A reduction in the normal negative change of the red blood corpuscles by the presence in the plasma of certain substances is also considered to play a part in the causation of lowered suspensive stability of the blood. Shaking the plasma with Kaolin retards sedimentation, whilst the addition of certain other substances such as gelatin accelerates it. (LINZENMEIER).

Certain other influences doubtless play a small part. Thus the influence of CO_2 and O_2 has already been alluded to, as well as the erythrocyte volume, a high volume as in say polycythaemia, retarding, a low volume as in anæmia, accelerating the sedimentation velocity.

COOPER believes that the cholesterin content of the blood plays a part in the causation of increased S.V., and mentions the well-known hypercholesterinæmia of pregnancy, as well as that occurring in cancer, in support of this. He investigated the cholesterin content of the blood of the majority of

/his

his cases, and found that in all those showing accelerated rates there was an increase of this substance in the blood above the normal.

Salomon, de Potter and Valtis, however, have investigated this matter, and have come to the conclusion that an increase of blood cholesterin plays no part in the phenomenon, pointing out that in tuberculosis a hypercholes terinæmia is the rule.

The above brief sketch of the various views concerning the causation of this phenomenon does not pretend to be more than an epitome of current opinion concerning it. A full consideration of the subject is a matter for the physical chemist or advanced workers in physiology, and would be, besides, out of place in this thesis, devoted as it is to purely clinical considerations. For similar reasons an historical survey describing the evolution of the subject has not been presented, as that aspect has already been dealt with exhaustively by FAHRAEUS

VI.

RESULTS.

We may now consider the results obtained in the 72 cases of mental disorder. Before doing so, however, it is necessary to examine the results obtained in the normal subjects, comparing them with Cooper's figures in the normal. Only results obtained by Cooper's method are given in the following, Bochner and Wassing's method being ultimately abandoned for the reasons set out above.

Twenty one controls were examined. These were all men with excellent health records with one exception noted below, all male nurses save one.

No.	Hourly reading ces.
1.	4.1
2.	4.7
3.	4.5
4.	4.2
5.	4.3
6.	4.5
7.	4.1
8.	4.1
9.	4.3
10.	4.4
11.	4.5
12.	3.7
13.	4.6

No.	Hourly readings.
14.	3.7
15.	4.1
16.	4.1
17.	4.6
18.	4.1
19.	4.0
20.	4.1
21.	4.0

The first 20 of these men were in excellent health, the 21st suffered from chronic asthma and had had encephalitis lethargica about two years previously. It should be stated that the blood of the last three was withdrawn rather less than three hours after the midday meal (about 1½ to 2 hours) No. 19 left the staff shortly after and a second estimation was not possible, No. 20 objected, and in taking the blood of No. 21 a second time a small clot formed rendering the sample useless, and a third attempt was not made on account of extreme difficulty in entering his veins. The rather lower figure obtained in No.14 is possibly due to the fact that the subject underwent a resection of septum operation three weeks previously. No.12 had had coryza not long before.

Using the first eighteen figures then, the

average hourly reading is seen to be 4.25, and omitting Nos.12 and 14 about 4.3. The average of the last three is a little over 4.0.

With regard to the question of the influence of digestion on the S.V., it is somewhat surprising that so little mention of this is made in the various writings consulted. FAHRAEUS alludes to the possibility of digestion having an influence on the S.V. DE COURCY made observations on some of his patients at different times of the day, before and after meals, but no marked change in the S.V. was noted. Unfortunately an opportunity to investigate this point did not present itself for various reasons, the difficulty of persuading patients and controls to submit to frequent venipuncture during the day proving a considerable obstacle. It was therefore decided, in view of a possible influence of digestion on the S.V. to carry out the tests at a fixed period after the midday meal, that is, under standard conditions. It would appear doubtful, if digestion has any marked influence on the rate of sedimentation. ZECKWER and GOODELL state that "for any one person repeated determination over a long period of time indicate that the rate is nearly a constant quantity, altered only slightly under physiological conditions....."

It is now necessary to consider COOPER'S figures for normal persons. COOPER investigated the S.V. of 58 "normal" subjects, using his own technique. An

/examination

examination of his results shows his hourly readings to vary from 2.5 cc to 4.5 cc. He does not, however, furnish the percentage number of cases giving the former reading, nor indeed does he give any, even general particulars concerning the health of these controls. At this point it is perhaps desirable to state that possibly more information can be derived from a study of the curve, charted as described above, than from the hourly reading, but against this it may be said that in no case of the author's series, save one, had sedimentation gone its furthest at the end of one hour, or at any time prior to one hour, a fact determined by subsequent centrifugation or an observation of the twenty four hour level, so that the hourly reading seems to give just as valuable information as a study of the curve, for it may be said here that for an hourly figure of 2.5 ccs. to be obtained, the fall of the cells must have been sharp, and all cases of the present writer's series shewing this reading were regarded as pathological, and in these cases, with the exceptions noted below, some grave bodily disturbance was present. On the whole, then, the hourly reading is a satisfactory method of recording the results, as it is the shortest and most convenient, although COOPER seems to prefer the curve.

Reverting then to a discussion of the "normal" figures by this method, it is clear that as ZECKWER and GOODELL have stated, no hard and fast line can be

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drawn, and until one given method is made universal, and COOPER'S method has a strong claim to this distinction, and until also a very large number of healthy controls grouped according to age and sex is investigated by this method, the dividing line between healthy and diseased must necessarily remain nebulous, and all attempts to draw conclusions from small statistics prove, as ever, futile. Admitting this to be the case, however, it would appear highly probable that using this method, hourly readings between 5 and 4 cc. and including the latter figure, are to be regarded as within normal limits, and the following results are discussed on this assumption. The difficulty is experienced with the intermediate readings, which may be entirely neglected for all the information of value they give. One point more concerning COOPER'S figures for the normal, and those of the present writer, all those of the latter, with the one exception noted above, were obtained in thoroughly healthy persons, whilst COOPER gives no definite information concerning his controls, save that none of them had a red blood count of under 3,500,000 per cmm., and apparently did not suffer from tuberculosis, acute inflammation or malignancy, nor were pregnant. Possibly some of his lower readings were obtained in females (he has not grouped his results according to sex). Pending the investigation of a much larger number of controls by this method, COOPER'S low normal readings are to be

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regarded with some suspicion. If we accept COOPER'S figures, then the number of "positive" results in the following series is still further diminished.

The results obtained in the 72 psychotics now follow:-

(it was endeavoured in each case to carry out repeated estimations wherever possible, but owing to the death, transfer or discharge of a patient, or for mental reasons, or because of refusal, this was not possible in a certain number, and only one specimen was obtained accordingly in these cases.)

1. GENERAL PARALYSIS. (5 cases.)

Name.	Date of test.	Hourly reading in Ccs.	Res.	
J.G.E.	20.8.26.	3.8	?	
"	21.9.26	4.1	--	
"	30.10.26	3.3	? x	after malaria.
J.D.	24.8.26	3.7	? -	
"	24.9.26	3.5	? x	
J.H.R.	21.8.26	4.0	-	
"	29.10.26	2.9	x	during malaria,
"	5.11.26	2.8	x	"
"	10.11.26	2.5	x	"
"	16.11.26	2.0	x	Quinine commenced.
"	23.11.26	2.2	x	
"	26.11.26	2.4	x	
"	30.11.26	2.4	x	
"	10.12.26	2.8	x	
"	17.12.26	3.0	? x	

1. GENERAL PARALYSIS. (continued)

Name	Date of Test.	Hourly reading in Ccs.	Res.
J.H.R. (cont)	28.12.26	3.5	?
"	25. 1.27	4.1	--
A.M.A.	29.9.26	3.9	?--
"	4.12.26	3.3	? x
"	28.12.26	3.5	? x
R.T.V.	4.1.27.	3.1	? x

II. SENILE DEMENTIA. (2 Cases.)

Name.	Date of Test.	Hourly reading in Ccs.	Res.
A.B.	15.10.26	3.0	? x
"	24.12.26	3.1	"
F.F.B.	22.10.26	2.7	x
"	24.12.26	2.5	x

III. INSANITY WITH GROSS BRAIN LESION. (1 Case.)

Name	Date of Test.	Hourly reading in Ccs.	Res.
G.P.	2.10.26	4.2	-
"	31.12.26	3.6	? -
"	18.2.27	3.7	? -

IV. POST ENCEPHALITIC PSYCHOSES. (2 Cases)

Name	Date of Test	Hourly reading in Ccs.	Res.
F.G.S.	11.9.26	3.9	? -
"	17.11.26	4.3	--

IV. POST ENCEPHALITIC PSYCHOSES. (continued)

Name	Date of Test	Hourly reading in cc.	Res.	
H.B.	17.9.26	4.6	--	
"	16.11.26	3.8	? -	
"	4.12.26	4.2	--	
"	4.1.27.	4.3	--	
"	1.2.27.	4.7	--	Arm in water of about 37°c. temp. for 15 mins. prior to withdrawal of blood.

V. EPILEPSY. (3 cases.)

Name	Date of Test.	Hourly reading in ccs.	Res.
B.F.	2.10.26	3.8	? -
"	28.12.26	3.7	? -
T.B.	28.9.26	4.6	--
"	26.2.27	3.9	? --
C.R.	15.1.27	3.3	? x
"	26.2.27	3.7	? --

VI. ACUTE CONFUSIONAL INSANITY. (1 case.)

Name	Date of Test	Hourly reading in ccs.	Res.
J.R.L.	7.9.26	3.7	? --
"	1.10.26	4.1.	--
"	9.10.26	3.9	? --
"	3.12.26	3.4	? x
"	29.12.26	3.9	? --

VII. ALCOHOLIC PSYCHOSES. (3 Cases)

Name	Date of Test	Hourly reading in ccs	Res.
G.M.	5.10.26	3.1	? x
"	2.3.27	2.8	? x
H.A.	11.2.27	3.8	? -
"	1.3.27	3.5	?
W.B.	12.1.27	4.3	--
"	9.2.27	4.2	--

VIII. DEMENTIA PRAECOX. (36 cases).

Name	Date of Test	Hourly reading in ccs.	Res.	
C.W.S.	25.8.26	3.8.	--	
R.A.A.	28.8.26	2.2	x	
"	17.9.26	2.2	x	
S.B.S.	31.8.26	2.5	x	
"	9.11.26	3.2	? x	
P.G.P.	17.9.26	4.5	--	
"	23.10.26	4.3	--	
"	6.1.26	3.6	? -	Arm in water at temp. of about 37°C. for 15 mins. prior to withdrawing blood.
"	22.2.27	3.9	--	
R.E.W.	10.9.26	4.0	--	
"	5.11.26	4.4	--	
"	3.12.26	4.3	--	
"	18.12.26	4.2	--	
"	6.1.26	4.2	--	Arm in water at temp. of about 37°C. for 15 minutes as before.

VIII. DEMENTIA PRAECOX. (continued)

Name	Date of Test.	Hourly reading in ccs.	Res.	
W.S.S.B.	14.9.26.	4.1	--	
"	31.12.26	3.1	? x	
H.A.	15.9.26	4.2	--	
"	8.2.27	4.5	--	Arm in water of 37°C. as before.
W.J.R.R.	28.9.26	3.5	?	
"	21.1.27	3.6	? --	
E.L.C.	15.10.26	4.6	--	
"	10.11.26	4.7	--	
"	11.12.26	4.7	--	
"	14.1.27.	4.6	--	Arm in water of 37°C. temp. for 15 minutes as before.
G.G.	14.12.26	3.2	? x	
"	26.2.27	3.5	?	
F.W.S.	31.12.26	4.3	--	
"	1.3.27	4.4	--	
B.W.T.	22.12.26	3.0	? x	
"	21.1.27	3.2	? x	
W.C.C.	2.10.26	4.2	--	
"	27.10.26	4.1	--	
G.W.F.	28.12.26	3.2	? x	
"	8.2.27	3.2	"	
G.A.F.	14.9.26	4.2	--	
"	29.12.26	4.4	--	
"	25.1.27	4.4	--	Arm in water 37°C. for 15 minutes as above.

VIII. DEMENTIA PRAECOX. (continued)

Name	Date of Test	Hourly reading in ccs.	Res.	
J.T.D.	14.9.26	4.7	--	
"	26.11.26	4.6	--	
"	18.12.26	4.6	--	
"	1.2.27	4.6	--	Arm in water at 37°C. as before.
B.McL.	15.9.26	4.3	--	
"	1.12.26	3.8	? -	
T.H.W.P.	1.10.26	4.1	--	
W.W.E.	28.8.26	3.3	? x	
"	30.11.26	3.2	? x	
P.G.	8.9.26	2.2	-- x	
P.E.C.	19.10.26	4.7	--	
"	7.12.26	4.8	--	
R.W.S.	3.9.26	4.4	--	
"	11.2.27	2.8	x	
H.L.	22.9.26	3.7	--	
"	17.11.26	3.8	--	
"	18.12.26	3.1	? x	
E.D.S.	7.10.26	2.7	x	
"	19.11.26	2.6	x	
J.H.D.	10.9.26	4.5	--	
"	27.11.26	4.4	--	
"	8.2.27	4.4	--	Arm in water at 37°C. as above.
G.H.B.	21.9.26	4.4	--	
"	31.12.26	4.3	--	

VIII. DEMENTIA PRAECOX. (continued)

Name	Date of Test.	Hourly reading in ccs.	Res.
C.S.S.G.	22.12.26	3.0	? x
"	15.3.27	3.7	? -
F.H.S.	17.12.26	4.5	--
"	22.2.27	4.2	--
S.L.	21.12.26	3.9	? --
P.H.C.M.	29.9.26	4.1	--
"	16.11.26	3.0	? x
S.J.	21.12.26	4.5	--
"	1.2.27	4.4	--
C.B.	22.9.26	4.4	--
H.J.C.	See below.		
E.Q.	22.9.26	3.3	?
"	23.11.26	3.0	? x
"	11.12.26	2.4	x
"	18.2.27	2.1	x
"	22.2.27	2.2	x
"	1.3.27	2.2	x
"	8.3.27	1.9	x
"	15.3.27	2.0	x
E.T.B.	7.9.26	4.7	--
"	1.10.26	4.2	--
T.H.E.	5.10.26	4.1	--

IX. PARAPHRENIA (5 Cases)

Name.	Date of Test.	Hourly reading in ccs.	Res.
H.B.	24.9.26	3.8	? --
"	2.11.26	4.6	--
"	22.12.26	3.9	? --
J.D.	26.10.26	3.8	? --
S.O.	21.12.26	3.9	? --
"	21.1.27	4.0	--
J.R.S.	4.1.27	3.8	? --
R.M.	9.11.26	2.6	x

X. PARANOIA (2 Cases)

Name.	Date of Test.	Hourly reading in ccs.	Res.
E.P.	7.10.26	3.6	? --
F.C.	21.12.26	4.6	--

XI. MANIC-DEPRESSIVE-PSYCHOSIS (13 cases).

	Name	Date of Test.	Hourly reading in ccs.	Res.
Mania	A.G.V.	10.11.26	4.6	--
	"	1.12.26	4.5	--
	E.S.F.	4.1.27	3.3	? x
	"	18.1.27	3.4	"
	"	15.3.27	3.3	"

XI. MANIC-DEPRESSIVE-PSYCHOSIS (continued)

	Name	Date of Test	Hourly reading in ccs.	Res.	
Mania	C.H.A.	10.12.26	2.7	x	
	"	17.12.26	2.6	X	
	"	29.12.26	2.4	x	
	"	15.1.27	2.7	x	
	"	11.2.27	2.9	? x	
Melancholia	E.J.E.	11.9.26	4.3	--	
	J.C.	24.9.26	4.4	--	
	A.T.S.	5.10.26	4.4	--	
	"	27.11.26	3.7	? --	
	"	2.3.27	4.4	--	
	T.T.	13.10.26	4.4	--	
	S.C.	19.10.26	3.1	? x	
	C.N.O'S	9.11.26	3.2	? x	
	"	18.1.27	4.0	--	
	A.J.M.	17.11.26	4.5	--	
	"	25.1.27	4.6	--	Arm in water at 37°C. for 15 mins. as before.
	G.K.N.	14.12.26	3.0	? x	
	"	29.12.26	2.6	x	
	G.M.D.	12.1.27	4.3	--	
	"	2.3.27	4.0	--	
	A.E.	28.12.26	3.7	--	
	"	9.2.27	3.4	? x	

DISCUSSION OF RESULTS.

We must now proceed to examine these results in greater detail. With regard to General Paralysis, unfortunately only five cases of this disorder were available for examination during the period. It was fortunate, however, that these five represented, at least clinically, different grades of this disease, ranging from a "mild" case (J.H.R.) at the one end to an advanced case (R.T.V.) at the other.

It will be remembered from the survey of the literature that the majority of the observers found not merely an increased, but a markedly increased rate of sedimentation in this disease. Now bearing in mind that employing Cooper's method only the grosser degrees of increased sedimentation velocity are made manifest, or are to be taken account of, this marked increase of rate is not observed in any of the five cases examined, except after the infection by malaria, undertaken in three of them. One of these indeed, (J.H.R.) gave a figure before malaria treatment which may be regarded as within normal limits. This was the case, as reference to the appendix will shew, in which mental and also physical impairment was least. J.G.E. exhibiting dementia (prior to the malaria) gave on one occasion a normal figure, and on the other a figure probably to be regarded as falling within this category. After malarial infection, of course,

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/rate increased. J.D. gave doubtful figures, but still mot definitely abnormal prior to malaria. A.M.A., an old standing case, not on this occasion treated with malaria, also gave doubtful figures, whilst that of the last case exhibiting considerable deterioration, mentally and physically, gave a reading which was probably pathological, but again not definitely so. From a consideration of the above then it is quite impossible to draw any definite conclusion as to the constant occurrence of an increased rate pf sedimentation in this disease.

Three of the above cases, as stated, were treated with Benign Tertian Malaria (mosquito infection) during the period of the investigation.

As there is at present no definite means of ascertaining the degree, if any, of improvement in General Paralysis following malarial treatment, the personal equation bulking largely in the estimation of such, and as Serological improvement is only to be observed in a few cases, it was decided to investigate the S.V. before and during infection by malaria, and after its complete subsidence, with a view to ascertaining if the sedimentation test was of any value in this connection. Three cases were available for this purpose, but unfortunately two of them died during the treatment and only in the third was it possible to carry out the observations as desired. It will be seen that in this case (J.H.R.), following the infection by malaria

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there
/is a distinct increase in the S.V., the rate continuing accelerated for some time after the termination of the infection by quinine, and only returning to normal about two months after the last dose of this drug had been administered. As the hourly reading in this case prior to malaria may be regarded as normal, this series of results gives no information as to any improvement which may have been obtained. As a matter of fact, in this case there was no evident clinical improvement mentally or physically following this course of treatment. Further work on this point in hospitals where a large number of cases of General Paralysis is admitted seems desirable. From such a small number of cases examined it is impossible to draw any definite conclusions as to the average S.V. in this disease, and it has not been possible to ascertain any value the test may have in indicating improvement following malarial treatment. Under the circumstances all that can be done is to throw out a suggestion for further work in this direction. It is, of course, obvious that this test can play no important part in the diagnosis of General Paralysis, as we have already at our command a large number of laboratory tests for use in this connection, Wassermann reaction in blood and fluid, the Colloidal gold reaction etc., so that the addition to the diagnostic armamentarium of a non-specific test such as the one under consideration is superfluous.

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In regard to prognosis the test might have a certain value, but here again, in view of the nature of the disease, it tends to be redundant, and clinical observation can usually, if not always, give the necessary information.

In the two cases of Senile Dementia examined, one series of results is to be regarded as "positive" the other as doubtful in character, but here again a positive finding is of none, or slight value in the diagnosis of this condition, and its value in prognosis is similarly doubtful for the reasons given above in connection with General Paralysis. For this reason no further cases of senile psychoses were investigated.

Only one case of "Insanity with gross brain lesion" was obtainable, but the results in this case do not merit further discussion, negative or doubtful results being obtained.

Only two cases of Post-encephalitic psychoses were available. The results obtained fall into line with those of PAULIAN AND TOMOVICI and POPPER AND KREINDLER in these cases as low S.V. being obtained.

In the cases of epilepsy examined, figures within normal limits or else doubtful figures were found in all. In one of them (C.R.) it is perhaps of interest to note that there is a slight rise in the hourly figure on the second occasion, the first figure being obtained when the patient was in a confused and dazed condition following a fit, but at the risk of repetition, it is

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desirable to point out that undue importance must not be attached to this finding. As the fits in one of the cases (T.B.) are well controlled by Luminal, it was found impossible to examine the blood immediately after one. The writer has thus not been able to verify Glans' assertion that an increase of the S.V. follows a fit, unless perhaps in the doubtful instance quoted.

Some hopes were entertained at first that in Acute Confusional Insanity, where a recovery can be hoped for, the sedimentation test might prove of some value in furnishing a guide as to the progress of the case. Unfortunately, during the whole period in which the observations were made, only one case of this psychosis was admitted to the male side. The results obtained in this case are not encouraging. The figures to begin with cannot be regarded as definitely abnormal and although this patient progressed to an apparently complete recovery, and his ultimate discharge from hospital, the degree of clinical improvement was not reflected in the results obtained. For instance, the figure 4.1 cc (1.10.26) was obtained when the patient, although improved somewhat in his mental condition, was still displaying marked mental symptoms. As an instance of the degree to which an apparently trifling infection, in this instance a common cold, can modify the S.V., the figure 3.4 cc (3.12.26) may be cited. A fall of

/0.5 cc

0.5 cc. from the previous reading is observed, Of course it must be remarked that this reading itself is not definitely abnormal, and the difference is slight, but it is as well to bear in mind the possibility of such variations, apparently due to minor influences of the kind cited. With regard to the value of the test in this psychosis further work is required. Repeated observation of the S.V. in a large number of cases might furnish results of value, but on the whole it would appear doubtful.

Three cases of Alcoholic Psychoses were examined. There is some doubt as to whether the third case should really be placed in this category, as no satisfactory history was forthcoming, but alcohol was suspected. The results again give no information of value. In the first case (G.M.) the first reading - a somewhat doubtful value - was obtained when the acute symptoms were at their height, the second figure, taken five months later, when the condition had entirely cleared up, shows a slight if negligible, drop. The influence of other organic factors here, the Pyorrhoea Alveolaris may be taken into account to explain these rather low readings. But it is doubtful if this chronic infection is of importance in this connection, as some other cases displaying it gave normal figures. Normal or doubtful figures were obtained in the second case, although acute symptoms were present on each occasion, and in the third case,

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frankly normal figures were obtained.

We turn now to a consideration of the cases of Dementia Praecox, which cases have constituted one half of the series. These have been roughly classified, according to mental symptoms, the first 21 are those exhibiting the greatest degree of mental impairment, intellectual, emotional and conative, and include all the cases of catatonic stupor examined. Of the whole series sixteen gave results on all occasions the blood was examined, definitely within normal limits. A seventeenth case (H.J.C.) gave a reading well within normal limits by Bochner & Wassing's method, taking six hours to reach line 12. It was impossible for mental reasons to obtain more blood in this case. Two others (C.W.S. and S.L.) gave results closely approaching the normal, and probably to be regarded as falling within this category. The remainder defy exact classification, as the readings range from 3-4 ccs. and over at different periods in each case. Six cases, however, constantly or occasionally, gave definitely pathological results. Of these the low readings obtained could be accounted for in three by the presence of gross physical disease; in the other three no such basis could be determined. The outcome of the above analysis, then, is that only three cases of Dementia Praecox, apparently per se, gave definitely abnormal hourly readings, and of these, one, (R.W.S.) gave a normal reading the first time the blood was

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examined. This patient refused further examination.

One of the three cases suffering from gross physical disease (S.B.S.) gave a reading on the second occasion higher than the first, and not definitely abnormal on this occasion, an occurrence surprising, in view of the fact that clinically, his physical condition was worse at this time. It is to be remarked that many cases in the above series showing stupor gave consistently normal, even high readings on repeated examination. Thinking that perhaps stasis of the blood in the limbs of many of those stuporose cases might influence the result, it was tried immersing the arm in water at a temperature of about 37°C. for fifteen minutes, prior to the withdrawal of the blood: this was without influence on the result in any case, save one (P.G.P.) where a drop of 0.7 cc. from the previous reading was obtained. As this, however, might have been due to a common cold, which as we have seen above appears to be capable of influencing the result to a slight extent, this observation may be discounted. The above was also tried in one of the manic-depressive cases showing a high reading, and in one of the post encephalitic cases, here also without influence on the result. In this latter instance the reading was higher than on any previous occasion.

In the cases showing physical disease, one (E.Q.) must be specially mentioned, for in connection with

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this type of case the sedimentation test would appear to be of definite utility in mental hospital practice.

As is well known, the diagnosis of Pulmonary tuberculosis in the insane, particularly in cases of Dementia Praecox, is fraught with considerable difficulty, and a diagnosis based on physical signs frequently impossible to obtain. The case in question is instructive. At the beginning of the investigation in this patient the hourly reading was 3.3 cc. but this reading, although somewhat low, aroused no suspicion. It may be mentioned that he had been under suspicion for tuberculosis for some time previously, but though frequently examined, nothing definitely abnormal was found. The second reading showed a drop, but the difference was slight, but the progressive drop noted thereafter up to the fourth reading aroused apprehension, and at this time the patient was noticed to be extremely pale and a slight loss of weight was reported: there was no rise of temperature, however, and no cough. He was therefore put to bed, when examination a day or so later revealed a tuberculous focus in the left lung and a four hourly temperature chart showed the characteristic remission. Tubercle bacilli were later found in the sputum. The rate of sedimentation has since then remained fast. On 5.3.27, $\frac{1}{2}$ cc. daily intramuscular injections of "Collosol" Antimony as recommended by MOXEY were commenced, but no influence on the rate of sedimentation has so far been observed

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/this treatment. The patient in question exhibits considerable mental impairment and physical examination is difficult in consequence, but the physical signs of advanced phthisis are quite unmistakable in this case, even without much assistance from the patient. It would seem, therefore, from the above illustrative case, that the sedimentation test has a distinct value from the point of view of diagnosis in this class of case, and that it might find a practical application in mental hospital practice, suggesting that in all suspected cases, the S.V. should be determined at frequent intervals, and where a definite progressive increase of rate is found, the patient should be put to bed forthwith, and the usual hygienic measures instituted, in this way giving the patient a considerably greater chance of recovery. The test is, of course, not diagnostic of any one condition, but in view of the notorious liability of cases of Dementia Praecox to Pulmonary tuberculosis, its usefulness in a diagnostic aid in this condition is somewhat enhanced, on this account, and also because such cases cannot give the necessary intelligent co-operation in the physical examination.

The cases of paraphrenia gave results similar to those obtained in Dementia Praecox. The inclusion of the five cases given under this head is not perhaps wholly satisfactory, since one of them (H.B.) was not under observation for a sufficiently long period, to

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render the diagnosis other than provisional. As to the others, some psychiatrists might regard them as cases of Dementia Praecox; they are, however, old standing cases, to whom the criterion-preservation of the personality - has been applied successfully.

The case (R.M.) who gave an abnormal figure, was going downhill at the time of the test, but no definite cause for the rapid S.V. rate was assignable at the time. It would appear that this test is of no value in differentiating Paraphrenia from Dementia Praecox.

The two cases of Paranoia examined gave, one, a negative, the other, a doubtful result. Second examinations were not possible. The case with tabes is interesting, in view of the findings of PAULIAN & TOMOVICI in this disease, as, however, the case appears to be a stationary one, this may have influenced the result.

In the thirteen cases of Manic-depressive psychosis, the general findings of PLAUT, RUNGE & GLAUS in this psychosis have been confirmed, no acceleration being noted, save in a few instances, but it is clear from the character of the results, that no definite conclusion can be drawn. One of these cases (E.J.E.) is interesting from a general standpoint in regard to the sedimentation test. This patient showed, as will be observed, a result well within normal limits. No second estimation was made as the patient died soon

/after

after. Autopsy revealed extensive calcareous degeneration of the coronary arteries, together with a fine cirrhosis of the liver (see appendix), yet despite this, the S.V. was slow and did not reflect the pathological change in the organism. This case appears to suggest very strongly that it is only in the presence of acute processes, that the S.V. is materially, if at all, increased.

An opinion, indeed, is borne in on one all the more strongly when cases like that of General Paralysis (J.H.R.) and that of E.Q. suffering from Pulmonary tuberculosis are considered. In the first case, although the patient was the victim of a chronic infection, the S.V. was within normal limits, and only on the advent of an acute infection was it materially accelerated. Similarly with the latter case, figures were obtained prior to the onset of the tuberculosis from which no definite conclusion could be drawn, succeeded by definitely abnormal figures after the onset of the disease in question. At the same time although the above is doubtless the rule, an increased S.V. is sometimes found in cases in which no acute process is manifest, as for instance in one of the cases of Senile Dementia (F.F.B.) cited above.

During the performance of many of the above tests, when an obviously abnormal rate was found, it was thought perhaps that the age of the subject played a considerable part. This may be to some

extent the case, but it must be pointed out that many of the subjects examined, notably several in the Manic-Depressive Group, (A.J.M., H.A.E., E.M.D. for instance) were well past middle life, and these gave normal figures.

On the other hand G.K.N. giving a definite history of syphilis, gave a pathological figure in at least one instance. This case has been included under this heading for convenience, but in view of the etiology (syphilis) really deserves a separate category, as he is probably an "organic" case, displaying as he does well-marked arteriosclerosis, which also probably includes his cerebral vessels, giving rise to some gross morbid change in the brain tissue.

In the case C.H.A. the abnormal figures are perhaps to be accounted for by the presence of a septic skin lesion, which, however, had cleared up some little time prior to the performance of the last test.

Lastly, the figures obtained in the case E.S.F. are interesting. The three readings are practically identical, yet at the third test the patient's mental symptoms, elation, garrulity, etc. had almost entirely cleared up, and he was then enjoying parole. No indication of this clinical improvement is given by observation of his S.V.

Having discussed the questions of technique etc.

/and

and having completed an analysis of the results obtained in the seventy two cases of mental disorder, the general conclusions may now be summarised. Before doing so, however, the writer desires to express his thanks to Dr. W. Robinson, the Medical Superintendent, for permission to use the clinical material.

CONCLUSIONS.

(1) Cooper's technique is superior to that of Bochner & Wassing and allied methods.

(2) The sedimentation test is of no value in the differential diagnosis between the various psychoses.

(3) The test has no value in estimating the degree of mental improvement or deterioration in such cases.

(4) The existence of a constant and marked acceleration of sedimentation velocity in General Paralysis has not been confirmed.

(5) The Sedimentation Test is of value in mental hospital practice, in assisting towards an earlier diagnosis of Pulmonary tuberculosis than is usually obtained in those cases where, owing to mental impairment, the patient is unable to give the necessary intelligent co-operation in the physical examination; and that its value in connection with the diagnosis of this condition in such patients is greater than in the sane.

(6) It appears probable that chronic processes do not materially influence the sedimentation velocity of the erythrocytes.

N.B. - In the following cases no change mentally or physically was observed during the period of the observation, unless otherwise stated.

VIII

APPENDIX.

General Paralysis.

Case I. J.G.E. aet. 39. Electrical Engineer.

1st Test 20.8.26.

Physical State - Pupils equal, circular and moderately dilated, reacted briskly to light and to convergence - Slurring of speech - Deep reflexes markedly exaggerated - Gait unsteady (lurching) - Slight inco-ordination - No tremor of hands - Nothing abnormal found in cardio-vascular, or any other system.

Mental State - Dull, apathetic, fatuous - Poverty of ideation - Memory poor. Had malaria treatment prior to admission, but showed no symptoms of disease.

Reinfected B.T. Malaria 12.10.26.

Laboratory Findings - Blood Wassermann +40+;

C.S.F. Wassermann +40+; Cells ++ ; Protein +++ ;

Lange 555555531.

2nd Test 21.9.26.- when mental and physical condition was as above.

3rd Test 30.10.26.- when patient was suffering from typical B.T. malaria. - No parasites found in blood at this time. Patient died suddenly 3.11.26.

Case II. J.D. aet.44. Admiralty messenger.

1st Test 24.8.26.

Physical State - Pupils equal, circular and moderately dilated, reacted to light and to convergence - slight slurring of speech - Deep reflexes exaggerated - Slight Rombergism - No evidence of organic disease in any other system.

Mental State - Deep depression, at times irritable and childish, whimpered at withdrawal of blood, which was obtained with some difficulty on each occasion. Poverty of ideation - Recent memory defective - Faulty in habits.

Labatory Findings - Blood Wassermann + 40 +; C.S.F. (under pressure) Wass. React. + 40 +; Cells + +; Protein + + ; Lange 55555 ---; Infected with B.T. malaria 12.10.26.

2nd Test 24.9.26. when mental and physical condition as before. (Refused to have blood withdrawn again). Patient died broncho-pneumonia date 1/11/27 - No p.m. allowed

Case III. J.H.R. aet.29. Clerk in Holy Orders.

1st Test 21.8.26.

Physical State - Pupils equal, circular and rather widely dilated, did not react to light and scarcely at all to convergence - Speech normal - All deep reflexes especially knee jerks markedly exaggerated - Gait and posture normal - Fine tremor of tongue, none of fingers - No evidence of organic disorder in any other system . Perception good.

Mental State - Somewhat fatuous and morbidly submissive.

Laboratory Findings - Blood Wassermann +; C.S.F. Wassermann +; Increased globulin (Pandy); Cells = 40 per cmm; No Lange obtained.

2nd Test 29.10.26 - Suffering from B.T. Malaria. Temp. 103.2°F, 4 hours after rigor.

3rd Test 5.11.26.- Temp. 103.4°F. 5 hours after rigor. Patient in sweating stage (3 p.m.).

4th Test 10.11.26.- Temp. 101°F 10th Rigor 2 hours later (5 p.m.) Rosettes and mature forms found in blood.

5th Test 16.11.26. - Temp. 98° 16th rigor. Quinine Sulphate grs.v. t.i.d. commenced and continued thus for 10 days. - No further rigor, a few insignificant rises of temperature till 20.11.26.

Patient slowly regained his "normal" condition, on 30.11.26 patient was on small doses of Liq. Arsenicalis and Ferr. et Ammon. Cit.

5 months after commencement of malarial treatment, there is no obvious change in the physical or mental condition.

Case IV. A.M.A. aet.46. Civil Engineer. (Duration of disease 5 years)

Physical State - Pupils equal, circular and moderately dilated - React to light - Reflexes of arm exaggerated - knee jerks absent. Nothing further abnormal found. ?Tabo-paresis.

Mental State - Dull, apathetic, somewhat surly in manner.

Laboratory Findings- Blood Wassermann 4444; C.S.F. Wassermann 44444; 35 cells per cmm. (almost all small mono-nuclear) Total protein 0.075%; Nonne Apellt. pos; Lange 455555555.

2nd Test 4.12.26.

3rd Test 28.12.26.

Mental and physical condition as above on both these occasions.

Case V. R.T.V. aet.56. Clerk. (Duration of disease 4 years).

Physical State- Thin, emaciated - Pupils equal and circular, pin point. No reaction to light or convergence. Hyper-sensitivity of skin - Impossible to make a satisfactory physical examination on account of his resistiveness and also considerable degree of rigidity.

Mental-State - Childish. Demented. Faulty in habits

No laboratory findings, appear to have been obtained in this case and the patient is far too resistive and troublesome to attempt lumbar puncture.

Senile Dementia.

Case I. A.B.

Physical State - Temporal and radial arteries thickened and tortuous. Heart not enlarged - Sounds closed. - Pyorrhoea Alveolaris.

Mental State - Dull and demented. Cried like a child when blood was withdrawn. Difficulty was experienced in taking blood from this patient.

Case II. F.F.B. aet.75. Solicitor.

Physical State - Heart enlarged to left: loud blowing prerystolic and systolic murmur in mitral area, not propagated. Sounds at base muffled. Well-marked arteriosclerosis especially of temporal arteries. Senile tremor of head and hands.

Mental State - A cheerful and placid dement. Mutters incoherently. Marked anterograde amnesia.

Insanity with gross brain lesion (1 case).

Case G.P. aet.47. Packing-case maker.

Physical State - Pupils equal, circular and moderately dilated - React to light and to convergence. - Slight fine tremor of tongue. Left hand grip very weak as compared with right. Abdominal reflexes present and brisk. Plantar flexor on both sides (stocking soles) though a Babinski's sign present in one on left side when obtained by Oppenheim's method. Left knee jerk greatly exaggerated. No clonus rectus or ankle. Spasticity of muscles of left leg and a pes cavus has resulted in consequence.

Mental State - Dull and depressed. He fails to give a good account of himself.

Post-Encephalitic Psychoses.

Case I F.G.S. - M. 30. French Polisher. Furnished a history of diplopia about 18 months ago.

Physical State - Mask-like face, stooping posture and very slow movement. Slight rigidity of muscles. - Tremor of tongue and slight fine tremor of hands. Co-ordination good. - Sensation unimpaired. Pupils are equal, circular and moderately dilated, react well to light (direct and consensual) and to convergence. Deep reflexes - knee jerks markedly exaggerated. No rectus or ankle clonus.

Mental State - Extremely depressed on admission - had made a suicidal attempt by cutting throat just prior to admission. The depression has almost entirely cleared up and his emotional tone now seems one of apathy. He is intensely hypochrondrical. In view of the history of diplopia, the physical signs in the nervous system and the hypochrondriasis, it seems justifiable to regard the case as a post-encephalitic manifestation. He objects to the blood being withdrawn and only yielded on the last occasion with much coaxing.

Case II. H.B. M. 22. Upholsterer.

Physical State - Pupils equal, circular and moderately dilated, react to light and to convergence. - Mask-like face - All deep reflexes exaggerated. - Coarse tremor of tongue. Tic-like movements of face. There is a history of encephalitic lethargia.

Mental Condition - Dull and apathetic. Marked psychomotor retardation. Will not converse spontaneously and does no work, but sits about in one position all day.

Epilepsy.

A. Idiopathic Epilepsy (2 cases).

Case I. T.B. 50. Labourer. Grand Mal.

Physical State - Slight thickening of radial arteries, otherwise there was no evidence of gross organic disease. Has suffered from epilepsy from birth.

Mental State - Somewhat dull, but not depressed and works well in the ward. On admission suffered from fits one about every ten days. He has no warning of a fit. The fits are now fairly well controlled by "luminal".

Case II. B.F. M. 47. Petit Mal.

Physical State - Dullness of right apex, with weakness of respiratory murmur over this area. V.R. ± No accompaniments. Apparently an old healed lesion, as the existence of above physical signs has been known for sometime past to the writer since his first examination of patient in Sept. 1925, and there has been no change since. - Rt. pupil larger than lt. Rt. pupil fixed and l. reacts very sluggishly to light. Opacities in R. cornea. His epilepsy is of the Petit Mal type, the "fits" being of the nature of "fainting" attacks.

Mental State - He is an imbecile. He is childish and simple-minded. Knowledge is very defective.

Case III. C.R. 48. Ex-Jockey. Jacksonian Epilepsy.

Physical State - As a result of a fall from a horse there resulted an extensive fracture of the skull involving the l. parietal and frontal bones, which has involved severe injury to the underlying brain destroying the l. Rolandic area and part of the parietal lobe. The exact nature of the lesion is manifest in the symptoms and signs which are as follows:

Complete hemiplegia including face with complete hemianaesthesia on R. side involving all modes of sensation. Patient holds R. arm in characteristic hemiplegic position. R. knee jerk exaggerated. Plantar reflex extensor. The accident occurred in 1910. Since 1912 patient has suffered from fits. These are frequent and severe followed by much mental confusion. His mood following a fit is irritable and he is in consequence quarrelsome and impulsive.

Mental Condition - See above.

S.T. 15/1/27. - Blood taken whilst in dazed and confused condition following a fit.

S.T. 26/2/27. Pt. in his usual condition.

Acute Confusional Insanity (1 case).

Case J.R.L. 26. Warehouseman.

P.St. Pupils are circular but unequal .R. about 3mm. in diameter greater than left. Rt. pupil fixed, and both sluggishly
l. reacts to light sluggishly /to convergence. Discs- Left. Somewhat blurred on nasal side. Knee jerks very markedly exaggerated. In bed since admission. Blood Wassermann negative.

Mental State - Confused, and restless. He suffers from auditory hallucinations. His mood is sometimes one of elation and sometimes one of depression. He is impulsive and full of tricks.

1st Sedimentation Test 7.9.26. when mental condition as above. Still confined to bed.

2nd S.T. 1.10.26. - when condition slightly improved, although he was still confused and restless. Still in bed.

3rd S.T. 9.10.26. Improvement still maintained. Still in bed.

4th S.T. 3.12.26. Considerably improved. Auditory hallucinations now absent. Quiet and orderly in conduct. Physically suffering from a common "cold".

5th S.T. 29.12.26. Psychosis cleared up. Two days later was allowed out on "parole".

5.2.27. Discharged "Recovered".

Alcoholic Psychoses.

Case I. E.M. 73. Labourer. Definite history of alcoholic excess.

Physical State - Radials thickened - Some pyorrhoea Alveolaris - All deep reflexes exaggerated - Slight rippling tremor of tongue. There was some sugar in the urine on admission.

Mental State - Confused and slightly disorientated in time and space. Auditory hallucinations. Delusions of persecution based on these. Marked instability of temper.

1st S.T. 5.10.26. when symptoms as above.

2nd " 2.3.27. At this time psychosis practically cleared up and above symptoms gone.

Case II. H.A. 54. "Housekeeper".

Definite history of alcoholic excess.

Physical State - Undescended testicle. R. side.

Nervous System.- Mobility markedly impaired. Hyperaesthenia over certain areas notably over the precordium - Coarse tremor of fingers. All deep reflexes exaggerated. Slight inco-ordination (finger nose test).

Mental State - Depressed, anxious and apprehensive. Auditory and visual hallucinations. Believes he is going to be hanged or vivisected. Slight confusion also as evidenced by visual agnesia and imperfect orientation.

Case III. Etiology? Alcohol - No satisfactory history forthcoming.

W.B. M. 68. Caretaker.

Physical State - Radials thickened. No other abnormal features in Cardio-vascular system. Coarse tremor of hands - In fairly good health.

Mentally - Depressed, confused, disorientated in time and space. Memory for recent and remote events defective.

Dementia Praecox. (36 cases)

Case I C.W.S. 37. Tobacconist.

Physical State - Nothing abnormal found.

Mentally - Stuporose - catatonic, displaying flexibilitas cerea. Has been faulty in habits. Refused to allow a second sample of blood to be taken.

Case II R.A.A. 24. Medical Student.

Physical State - Emaciated and going rapidly downhill. Lungs - breath sounds faint - no evidence of tuberculosis in lungs.

Mental State - Dull, detached from reality - catatonic rigidity and immobility - negativistic - Displays mannerisms - Impulsive - occasionally faulty in habits.

1st Test 28.8.26. when condition was as above.

2nd Test 17.9.26. when temp. 102.6°F. No cough or sputum. Lungs - nothing abnormal found on auscultation.

Died 20.9.26. P.M. Findings: (Permission for thorax only). Broncho-pneumonia at both bases. Old healed calcareous tubercle at right apex. No other evidence of tuberculosis in lungs.

Case III. S.B.S. 33. Rubber Planter.

History of malaria contracted whilst in tropics.

Physical State - Cyanosis of lips. No enlargement of heart. Sounds clear and closed in all areas - No murmurs. No evidence of tuberculosis anywhere. In very low health and going down hill.

Mental State - Confused, disorientated, restless, impulsive, occasionally faulty in habits.

1st Test 31.8.26 when condition was above.

2nd " 9.11.26 when cachexia more marked. Comatose ? Malarial Cachexia.

Died 11.11.26. No p.m. allowed.

Case IV. P.G.P. 24. Student.

Physical State - Knee jerks exaggerated. General health is good and beyond finding noted, nothing abnormal found.

Mental State - Stuporose, mute, displays flexibilitas cerea. Impulsive.

Case V. R.E.W. 34. Clerk.

Physical State - Marked cyanosis of both hands.

Examination of cardio-vascular system negative.
Nothing further abnormal found.
Mental State - Stuporose, utterly detached from reality, auditory hallucinations - Speaks rarely, and then meaningless nonsense.

Case VI. W.S.S.B. 37. Student.
Physical State - In good health. Nothing abnormal found.
Mental State - Stuporose - mute - habits faulty.

Case VII. H.A. 37. Farm Pupil.
Physical State - Deep reflexes exaggerated, otherwise nothing abnormal found. In good health.
Mental State - Detached from reality - apathetic - silly smile.- mute.

Case VIII. W.J.R.R. 50. Medical Student.
Physical State - Nothing abnormal found.
Mental State - Stuporose - speaks rarely.

Case IX. E.L.C. - 25. No occupation.
Physical State - Deep reflexes exaggerated. Beyond this nothing abnormal found.
Mental State - Stuporose - speaks seldom.

Case X. G.G. 37. Waiter.

Physical State - No evidence of organic disease anywhere.

Mental State - Utterly detached from reality. He speaks rarely.

Case XI. F.W.S. 32. Army Officer.

Physical State - No evidence of organic disease

Mental State - Dull, listless and apathetic. Faulty in habits.

Case XII. B.W.T. 33. Officer in Mercantile Marine.

Physical State - Impossible to examine adequately owing to his mental condition. Health appears fair.

Mental Condition - Lies curled up in bed - extremely resistive - shouts foul language - Faulty in habits. Considerable difficulty in securing blood.

Case XIII. W.C.C. 63. No occupation (36 years history, began with symptoms highly suggestive of Dementia Praecox, hallucinations and delusions confirmed by subsequent course)

Physical State - Temporal arteries thickened and tortuous. Examination of heart negative. No sign of organic disease anywhere else.

Mental State - Demented - will not speak - mischievious - faulty in habits.

Case XIV. G.W.F. 55. Clerk.

Physical State - Nothing abnormal found.

Mental State - Apathetic, detached from reality. Does not converse readily. Auditory hallucinations.

Case XV. G.A.F. 28. Ex-Soldier.

Physical State - Nothing abnormal found.

Mental State - A placid, cheerful dement. Manneristic. Incoherence of speech.

Case XVI. J.T.D. 34. Clerk.

Physical State - Nothing abnormal found.

Mental State - Dull and indifferent. Laughs to himself without obvious cause, only speaks a few words and those meaningless. Clean in habits.

Case XVII. B. McL. 26. No occupation.

Physical State - Nothing abnormal found.

Mental State - Imbecility, to which Dementia Praecox is apparently superadded. Dull, listless, apparently absorbed in phantasy - Smiles a silly meaningless smile. Incoherent in speech.

Case XVIII. T.H.W.P. 25. Farm Pupil.

Physical State - Nothing abnormal found.

Mental State - Aloof and distant in manner. Negativistic. Does not converse readily and will not answer questions.

Case XIX. W.W.E. 45. Clerk.

Physical State - Knee jerks exaggerated. Both testes removed ?tuberculosis at age 20. In rather weak health, but nothing definitely abnormal found other than the above.

Mental State - Dull and weak-minded. Silly, talks incoherently. Manneristic.

Case XX. P.G. 38. Newspaper Vendor.

Physical State - Slight thickening of radial arteries. Cardiac sounds muffled at base - No murmurs. Nothing further abnormal found.

Mental State - Dull and apathetic. Auditory hallucinations. Verbigeration and stereotypy.

Case XXI. P.E.C. 34. Burma Police Officer.

Physical State - Heart's action irregular in rythmn and sounds muffled but closed - No murmurs. Ankle jerks not elicited.

Mental State - Recurring attacks of confusion in which he is disorientated, etc.

At time of second test was suffering from such an attack.

Case XXII. R.W.S. 20. No occupation.

Physical State - Reflexes superficial and deep exaggerated, otherwise nothing abnormal found.

Mental State - Confused - restless, impulsive, mischievious. Mood elated.

Case XXIII. H.L. 38. Labourer.

Physical State - Radial retinal arteries thickened, otherwise nothing abnormal found.

Mental State - Dull, listless and apathetic. Auditory hallucinations. Marked intellectual impairment.

Case XXIV. E.D.S. 49. Medical Student.

Physical State - Pyorrhoea Alveolaris - Fine tremor of hands. Nothing further abnormal found.

Mental State - Sullen, morose and hostile. Incoherent in speech. Cannot furnish his age.

Case XXV. J.H.D. 32. Teacher.

Physical State - Arteries hardened. Heart sounds poor in quality. No murmurs. Tremor of tongue. Nothing further abnormal found.

Mental State.- Hypochondrical. Volition weak. Incoherent in speech.

Case XXVI. G.H.B. 35. Insurance Agent.

Physical State - Examination failed to reveal anything abnormal. In good physical health.

Mental State - Auditory hallucinations and delusions based on these. Mood liable to sudden fluctuations. He is constantly complaining of one thing and another, but there is a characteristic lack of conviction in his tone.

Case XXVII. G.S.S.G. 46. Dental Mechanic.

Physical State - No evidence of organic disease.

Mental State - Dull and idle. He is querulous and intensely hypochondrical. Auditory hallucinations and delusions of persecution based on these.

Case XXVIII. F.H.S. 44. Bank Clerk.

Physical State - No evidence of organic disease.

Mental State - Dull, apparently absorbed in phantasy, probably experiences auditory hallucinations.

Case XXIX. S.L. 31. Seaman.

Physical State - No evidence of organic disease.

Mental State - Dull and apathetic, but is subject to changes of mood in which he becomes agressive and hostile.

Case XXX. P.H.C.M. 46. Kitchen porter.

Physical State - Old standing varicose eczema on right leg which occasionally breaks down into an ulcer. - Some arteriosclerosis. General health poor.

Mental State. - High grade imbecility with dementia praecox superimposed. Has expressed delusions of persecution but now is reticient concerning these - Has made indecent assaults on female children recently whilst on parole.

On occasion of second test 16.11.26. patient suffering from a common cold.

Case XXXI. S.J. 48. Ship's Steward.

Physical State - No evidence of organic disease.

Mental State - Weak-minded and fatuous. Subject to sudden changes of mood.

Case XXXII. C.B. 30. Bricklayer's labourer.

Physical State - No evidence of any organic disease.

Mental State - Dull and apathetic. Considerable intellectual impairment. No evidence of hallucinations or delusions.

Case XXXIII. H.J.C. 28. Labourer.

Physical State - No evidence of any organic disease.

Mental State - Auditory hallucinations. Verbigeration and stereotypy, but well orientated and works well.

Case XXXIV. E.Q. 26. Labourer.

Physical State - In weak health. Subject to recurring corneal ulcer. Beyond this nothing definitely abnormal made out.

Mental State - Dull and listless. Lacking in volition. Considerable intellectual impairment.

1st Test 22.9.26. - when condition as above.

No essential change was noted in his physical condition until 18.2.27. when he was noticed to be pale, but no cough or rise of temperature. He had been losing weight to a slight extent recently. 4th Test on this date.

He was put to bed and next day his temperature rose to between 103 and 104°F, but nothing found on physical examination. The next day physical signs were noted in the chest as follows: Marked dullness over left apex, clavicle and second and third interspaces, not in axilla and not marked at this time posteriorly, amphoric breathing and bubbling râles over this area. Tubercle bacilli were later found in his sputum. His condition has remained more or less unchanged from this date to date of last test recorded. On. 5.3.27. $\frac{1}{2}$ cc. injection of "Collosol" Antimony have been given daily intramuscularly.

Case XXXV. E.J.B. 33. Accountant.

Physical State - No evidence of organic disease. General health good.

Mental State - Subject to recurring attacks of excitement in which he is silly and displays mannerisms. He is confused and incoherent in speech at these times.

1st Test 7.9.26. - when patient was "normal"

2nd Test 1.10.26. Suffering from attack of excitement as described.

Case XXXVI. T.H.E. 21. Butcher.

Physical State - No evidence of organic disease.

Mentally - Subject to recurring attacks of insanity in which he suffers from auditory hallucinations and delusions of persecution based on these. Almost recovered at time of test. Patient escaped shortly afterwards.

Cases of Paraphrenia.

Case I. H.B. M. 36. Draper.

Physical State - No evidence of any organic disease anywhere.

Mental State - Depressed and anxious. Auditory and at one time visual hallucinations. Delusions of influence and persecution based on foregoing.

Case II. J.D. 52. Labourer. ?D.P.

Physical State - No evidence of any organic disorder anywhere.

Mental State.- Dull and apathetic. Auditory hallucinations, the voices of his persecutors.

Case III. S.O. 56. Farmer. Chronic Melancholia.

Physical State - No evidence of organic disorder anywhere.

Mental State - Depressed and anxious. Auditory hallucinations and delusions of persecution of a bizarre character, but not great detachment from reality.

Case IV. R.M. 64. Labourer.

Physical State - Losing weight and going down hill rapidly. Radials thickened. On examination nothing to account for change.

Mental State - Auditory hallucinations and delusions

of persecution - becoming demented.

Died 18.12.26.

P.M. Findings: Lungs- Both bases congested - fine chronic fibrosis throughout lungs. Heart - Myocardium shows no obvious pathological change. Some nodular thickening along line of closure of mitral valve. Liver - Nothing abnormal to note. Spleen - Enlarged, pulp diffluent. Kidneys - Capsule stripped with some difficulty in each case leaving a finely granular surface (Morocco-leather appearance).

Case V. J.R.S. 48. Courier.

Physical State - No evidence of organic disorder anywhere.
Mental State - Auditory hallucinations (voices) and delusions based on these.

Paranoia (2 Cases).

Case I. E.P. 4. Labourer.

Physical State - Heart and lungs healthy. All deep reflexes exaggerated. Abd. reflexes exaggerated. Plantars not obtained. Fine tremor of tongue and hands.
Mental State - Systematised delusion of persecution. No hallucinations.

Case II. F.C. 38. Bootmaker. Paranoia and stationary tabes dorsalis.

Physical State. Knee jerks both absent. Pupils equal circular but extremely contracted (pin-point), react neither to light nor convergence.

Mental Condition.- Systematised delusions of persecution. No evidence of hallucinations at any time.

Manic-Depressive Psychosis. States of Mania.

Case I. A.G.V. 55. Dock Labourer. 3rd Attack.

Physical State - Radials slightly thickened, beyond this no evidence of organic disorder found anywhere.

Mental State - Garrulous, elated and unduly emotional. He jumps from one subject to another and there is no goal idea; his talk in consequence is incoherent. There is a delusional trend inasmuch as he blames his employers for much of his trouble. Insight lacking.

1st Test 10.11.26. Condition as above.

2nd Test 1.12.26. - Much quieter and less elated.

Case II. C.H.A. 64. Ivory turner. -Chronic Mania subject to slight exacerbation.

Physical State - In bed with a skin rash consisting of scattered reddish patches over entire body, in some places a yellow crust had formed. Itching was present. The condition readily yielded to Ung. Hydrarg. Ammoniat.(1%)

Otherwise there was no evidence of organic disorder.

Mental State - He was quiet and displayed no elation, garrulity or restlessness (his usual mental features) during his stay in bed for the above reason.

1st Sedimentation Test 10.12.26.

17.12.26. Above skin condition improving. 2nd Sed. Test mental condition unchanged.

29.12.26. - Skin condition almost cleared up. 3rd S.T.

15.1.27. - Skin quite clear - mentally unchanged. 4th S.T.

Case III. E.S.F. 62. Mineralogist.

Physical State - Radials slightly thickened - Cardiac sounds muffled, but no murmurs. Heart not enlarged - Pyorrhoea Alveolaris - No signs of organic disease in nervous system or elsewhere.

Mental State - Garrulous, elated and restless. Marked distractability of attention. Flight of ideas, incoherent speech. Insight lacking.

Condition same on 2nd Test. 3rd Test - Patient practically recovered.

States of Depression.

Case IV. E.J.E. M. 50. Wine merchant.

Physical State - Complained of a heavy feeling in the upper part of the abdomen. Abdomen scaphoid, costal margin overhanging. Nothing abnormal found in the abdomen on examination. No evidence of organic disease in nervous or

any other system. His general condition was, however, poor. Mental State - Intensely depressed. He expresses delusions of unworthiness. Latterly refusing food and requiring tube feeding which he resisted to his utmost capacity. Despite this he got gradually thinner and weaker and finally collapsed with dramatic suddenness and died 23.10.26. P.M. Notes.- Lungs - Broncho-pneumonia at base of left lung, whole base markedly congested and portions sank in water. Heart- Myocardium normal - extensive atheroma of coronary arteries, with calcareous patches in their intima. Patchy atheroma of aorta. Liver - Enlarged, pale and hard, retained its shape when removed from the body as if hardened in situ. When cut into knife met with considerable resistance owing to fine fibrosis. Spleen - small and fibrotic - capsule wrinkled. Kidneys - Each organ enlarged and firm - capsule stripped with readiness in each case. Renal arteries markedly thickened and rigid. Brain - Pia-arachnoid thickened, but non-adherent. Cortex atrophied - oedema of cut surface of cerebral hemispheres - Superficial area of softening (liquefactive necrosis) upper part of left ascending parietal convultion. Cerebullum, pons and medulla - nothing abnormal found.

Case V. J.C. 39. Painter.

Physical State - Radials slightly thickened. Some Pyorrhoea Alveolaris. Fine tremor of hands and tongue, otherwise nothing abnormal found.

Mental State - Extreme depression. Marked psychomotor retardation. Memory for recent events defective.

Case VI. A.T.S. 42. Labourer. 2nd attack.

Physical State - Radials slightly thickened. Sounds clear and closed but second cardiac sound accentuated at base, especially at pulmonary area. No evidence of any gross organic disorder.

Mental State - Extreme depression. Seclusive. Suicidal on admission. No evidence of hallucinations.

Case VII. T.T. 40. Detective Sergeant.

Physical State - Radials slightly thickened. No evidence of gross organic disorder.

Mental State - Extremely depress/ed and suspicious. Had been suicidal but not whilst here. Delusion of persecution. After one month psychosis cleared up and patient was later discharged recovered.

Case VIII. S.C. 60. Labourer.

Physical State - Slight cyanosis of face. High tension pulse. Heart enlarged to left - 12 cm. from mid-sternal line. IVth sp. Auscultation revealed numerous extrasystoles, the pulse at wrist being imperceptible with these. Second aortic sound is snapping and high-pitched, but the sounds are clear and closed at all areas. There is a trace of

albumen in the urine. He is in a poor state of health on the whole.

Mental State - Extremely depressed and hypochondracal.

Case IX. C.N.O'S. 56. Medical practitioner.

Physical State - Emphysematous chest. Heart sounds muffled, but no murmurs. No evidence of organic disease anywhere else.

Mental State - Depressed and miserable, and agitated. He goes about saying "I'll never get well."

1st Test 9.11.26. Condition as above.

2nd Test 18.1.27. - Improved mentally - taking a greater interest in things.

Case X. A.J.M. 61. Company Secretary. Presenile Melancholia.

Physical State - Cyanosis of feet and ankles. No oedema, heart sounds inaudible at base. Slight fine tremor of hands. On the whole he is in poor physical health.

Mental Condition - Dull and depressed. Psychomotor retardation, he is completely lacking in initiative.

Case XI. G.K.N. M. 61. Secretary. Arteriopathic-specific.

Physical State - Temporal arteries thickened, but not radials. Heart enlarged to left-left.border 13 cm. from mid-sternal line. IVth s.p. Sounds clear and closed in all areas. No murmurs. Some pyorrhoea Alveolaris. - Slight tremor of hands, none of tongue. Slight Rombergism.

Previous History - Syphilis 34-35 years before - One testicle removed 7 years ago for "tuberculosis" (?Gumma) - Old Plastic gonococcal synovitis of left elbow joint which is ankylosed in flexon.

Laboratory Findings -

Cerebro-Spinal Fluid. 1.11.26.

Cells 1 per cmm.
Tot.Prot. 0.04 %
Globulin - Faintest detectable trace.
W.R. - negative.

Blood - "very weak partial positive."

Mental State - Depressed, self absorbed - filled with remorse poverty of ideation - retardation of the flow of ideas.

Case XII. A.E. 69. Timber Merchant.

Physical State - Pulse very irregular in rate and volume. Cyanosis of face and lips. Heart slightly enlarged to right- Presystotic thrill in mitral area. On anscultation loud, rough, presystolic and systolic murmurs, heard loudest over apex beat, but also outwards becoming progressively fainter as the axilla is reached. The valvular lesion is well compensated.

Mental State - Subject to recurrent attacks of extreme depression with auditory hallucinations really a confusional state. He was in a remission when blood was examined for S.V. 28.12.26.

Case XIII. G.M.D. 60. Bank Messenger. ?Pre-senile Melancholia.

Physical State - His urine showed a trace of albumen. Slight fine tremor of hands. Beyond this nothing abnormal was found in the physical examination.

Mental State - Extremely depressed. Delusions of unworhtiness. Poverty and retardation of ideation. At outset of psychosis he suffered from auditory hallucinations, voices. These are absent now.

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